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Model V-202, 352

Oscilloscope

SERVICE MANUAL

Hitachi Denshi, Ltd.

TOKYO, JAPAN

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1. Standards and Specifications

1-1 V-202

o Vertical deflection

Input sensitivity	×1 5mV/div to 5V/div (1,2,5-step 10 stages) ×5 1mV/div to 1V/div (1,2,5-step 10 stages)
Sensitivity accuracy rate	×1 ± 3% ×5 ± 5% Attenuates continuously to 2.5 times or more of the indicated value in each range
Frequency bandwidth (8 div Reference)	×1 DC to 20MHz $\left(\begin{smallmatrix}+1\\-3\end{smallmatrix}\ \text{dB}\right)$ AC 20Hz to 20MHz $\left(\begin{smallmatrix}+1\\-3\end{smallmatrix}\ \text{dB}\right)$ ×5 DC 5o 7MHz $\left(\begin{smallmatrix}+1\\-3\end{smallmatrix}\ \text{dB}\right)$ AC 20Hz to 7MHz $\left(\begin{smallmatrix}+1\\-3\end{smallmatrix}\ \text{dB}\right)$
Rise time	×1 Approximately less than 17.5ns ×5 Approximately less than 50ns
Over shoot	×1 ± 3% (at 100 kHz) ×5 ± 5% (at 100 kHz)
Input impedance	Direct 1MΩ, approximately 30pF
Maximum Input voltage	Direct 500V_{p-p} or 300V (DC + AC peak at 1 kHz) When using probe 600V (DC + AC peak at 1kHz)
Input coupling	AC-GND-DC
Magnifying function	×5 is possible
Operation mode	CH1, CH2, DUAL, ADD, DIFF
Dynamic range	more than 8 div.

o Horizontal deflection

Sweep mode	AUTO, NORM, TV(+), TV(-)
Sweep time	0.2 μs/div~0.2s/div(1-, 2, 5-step 19 stages)
Maximum sweep time	100ns (at MAG ×10)
Sweep variable	2.5 times or more
Sweep time accuracy	± 3% (at ×1) ± 5% (at ×10 MAG)
Sweep magnification	×10
Time linearity	±3% (at ×1) ±5% (at ×10MAG)
Position adjustment	Possible

o Triggering

Coupling	AC
Triggering polarity	+, -

Triggering sensitivity and frequency

Frequency	Internal	External
20Hz~2MHz	0.5~div	200 mV
2MHz~20MHz	1.5~div	800 mV

TV-V sensitivity	SYNC section more than 1 div or 1 V
External trigger input impedance	approx. 1MΩ, approx. 30pF
Maximum input voltage	Direct 300V (DC + AC peak at 1kHz) At using ×10 probe 600V (DC + AC peak at 1kHz)

o Z-AXIS brightness modulation

Voltage	Brightness is reduced with a positive signal of +5V or more
Frequency bandwidth	DC to 2 MHz
Input impedance	Approximately 47Ωk
Maximum input voltage	30 V (DC + AC) peak)

o X-Y operation

X input	CH1
Y input	CH2
Sensitivity	Same as vertical axis
X frequency bandwidth	DC to 500 kHz (-3dB)
Phase shift	Within 3° (DC to 50kHz)

o Calibrator

Waveform	1kHz square wave, within ±10% (Typical)
Voltage	0.5V ± 3%

o CRT

CRT	140 BMB 31R (5.5, square with internal graph)
Acceleration voltage	Approximately 2kV
Screen area	8 div ×10 div, 1 div=9.4mm
Trace rotation	Present
Scale illumination	Variable edge lighting

Power supply

VOLTAGE	FUSE
100 V (90~110 V)	2A
120 V (108~132 V)	2A
220 V (198~242 V)	1A
240 V (216~264 V)	1A

Power supply frequency	50, 60Hz
Power consumption	Approximately 45W

o Environment

Rated range of use:	+10 to +35°C
Limit of operation:	0 to +40°C
Storage and transport:	-20 to +70°C
Operating ambient humidity:	35 to 85%

o Construction

Dimensions	Approximately 275(W)190(H)×400(D)(mm) (Dimensions of cabinet)
Weight	Approximately 8.5Kg

o Vertical deflection

Input sensitivity	×1 5mV/div to 5V/div (1,2,5-step 10 stages) ×5 1mV/div to 1V/div (1,2,5-step 10 stages)
Sensitivity accuracy rate	×1 ± 3% ×5 ± 5%
	Attenuates continuously to 2.5 times or more of the indicated value in each range
Frequency bandwidth (8 div Reference)	×1 DC to 35 MHz $\left(\begin{smallmatrix}+1\\-3\end{smallmatrix}\ \text{dB}\right)$
	AC 20Hz to 35MHz $\left(\begin{smallmatrix}+1\\-3\end{smallmatrix}\ \text{dB}\right)$
	×5 DC to 7MHz $\left(\begin{smallmatrix}+1\\-3\end{smallmatrix}\ \text{dB}\right)$
	AC 20 Hz to 7MHz $\left(\begin{smallmatrix}+1\\-3\end{smallmatrix}\ \text{dB}\right)$
Rise time	×1 Approximately less than 10ns ×5 Approximately less than 50ns
Signal delay time	Possible to observe the rising edge
Over shoot	×1 ± 3% (at 100 kHz) ×5 ± 5% (at 100 kHz)
Input impedance	Direct 1MΩ, approximately 30pF
Maximum Input voltage	Direct 500Vp-p or 300V (DC + AC peak at 1 kHz) When using probe (DC + AC peak at 1kHz)
Input coupling	AC-GND-DC
Magnifying function	×5 is possible
Operation mode	CH1, CH2, DUAL, ADD, DIFF
Dynamic range	more than 8 div.

o Horizontal deflection

Sweep mode	AUTO, NORM, TV(+), TV(-)
Sweep time	0.2 μs/div~0.2s/div(1-, 2-, 5-step 19 stages)
Maximum sweep time	20 ns(at MAG ×10)
Sweep variable	2.5 times or ,ore
Sweep time accuracy	± 3% (at ×1) ± 5% (at ×10 MAG)
Sweep magnification	×10
Time linearity	±3% (at ×1) ±5% (at ×10MAG)
Position adjustment	Possible

o Triggering

Coupling	AC
Triggering polarity	+, -

Triggering sensitivity and frequency

Frequency	Internal	External
20Hz~5MHz	0.5~div	200 mV
5MHz~35MHz	1.5~div	800 mV

TV-V sensitivity	SYNC section more than 1 div or 1 V
External trigger input impedance	approx. 1MΩ, approx. 30pF
Maximum input voltage	Direct 300V (DC + AC peak at 1kHz) At using ×10 probe 600V (DC + AC peak at 1kHz)

o Z-AXIS brightness modulation

Voltage	Brightness is reduced with a positive signal of +5V or more
Frequency bandwidth	DC to 2 MHz
Input impedance	Approximately 47Ωk
Maximum input voltage	30 V (DC + AC peak)

o X-Y operation

X input	CH1
Y input	CH2
Sensitivity	Same as vergical axis
X frequency bandwidth	DC to 500 kHz (-3dB)
Phase shift	Within 3° (DC to 50kHz)

o Calibrator

Waveform	1kHz square wave, within ±10% (Typical)
Voltage	0.5V ± 3%

o CRT

CRT	140 DFB 31 (5.5, square with internal graph)
Acceleration voltage	Approximately 5.2 kV
Screen area	8 div ×10 div, 1 div=9.4mm
Trace rotation	Present
Scale illumination	Variable edge lighting

Power supply

VOLTAGE	FUSE
100 V (90~110 V)	2A
120 V (108~132 V)	2A
220 V (198~242 V)	1A
240 V (216~264 V)	1A

Power supply frequency	50, 60Hz
Power consumption	Approximately 45W

o Environment

Rated range of use:	+10 to +35°C
Limit of operation:	0 to +40°C
Storage and transport:	-20 to +70°C
Operating ambient humidity:	35 to 85%

o Construction

Dimensions	Approximately 275(W)190(H)×400(D)(mm) (Dimensions of cabinet)
Weight	Approximately 8.5Kg

2. Composition

Composition of Model V-202 and V-352 oscilloscope is as follows.

V-202

(1) Model V-202 oscilloscope unit 1
(2) Probe (AT-10 AF 1.5) 2
(3) Power supply cord 1
(4) Operation Manual 1

V-352

(1) Model V-352 oscilloscope unit 1
(2) Probe (AT-10 AF 1.5) 2
(3) Power supply cord 1
(4) Operation Manual 1

3. PREVENTIVE MAINTENANCE

Preventive maintenance, when performed on a regular basis, can Prevent instrument breakdown and may improve the reliability of the oscilloscope. The severity of environment to which this instrument is subjected will determine the frequency of maintenance. A convenient time to perform preventive maintenance is preceding recalibration of the instrument.

Disassembly

Remove the 5 screws in the top cover of the instrument. Gently separate the top cover from the instrument and lay aside. Most of the internal parts of the instrument are now accessible.

If access to the front of the Input circuit board is necessary, remove the knobs from all of the external control shaft. Remove the two screws securing the side panel to the Input circuit board and remove the instrument side panel. (See 5. DISASSEMBLY ILLUSTRATION.)

Cleaning

The instrument should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause component breakdown.

The covers provide protection against dust in the interior of the instrument. Loose dust accumulated on these covers can be removed with a soft cloth or small brush.

Dirt that remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

Cleaning the interior should only be occasionally necessary. The best way to clean the interior is to blow off the dust with a dry, low-velocity stream of air. A soft-bristle brush or a cotton-tipped applicator is useful for cleaning in narrow spaces or for cleaning more delicate components.

Visual Inspection

The instrument should be inspected occasionally for such defects as broken connections, improperly seated transistors, damaged circuit boards, and heat-damaged parts. The corrective procedure for most visible defects is apparant; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, correcting the cause of the overheating is important to prevent recurrance of the damage.

4. CALIBRATION.

Hitach Denshi, Ltd. provides complete instrument repair and recalibration at out oversea's office, and authorized dealer. Contact your local Hitachi Denshi, Ltd. office or representative.

4.1 TEST EQUIPMENT REQUIRED

The following test equipment and accessories, or equivalent, are required for the complete calibration of the V-202, 352. The given specifications for the test equipment are the minimum necessary for accurate calibration. Therefore, the specifications of any test equipment used must meet or exceed the listed specifications. All the test equipment is assumed to be correctly calibrated and operating within the listed specification, operating instructions for the test equipment are not given in this procedure. Refer to the instruction manual for the test equipment if more information is needed.

Table 4-1

TEST EQUIPMENT REQUIRED

Description	Minimum Specification	Usage	Examples of Applicable Test Equipment
1. Constant Amplitude Signal Generator	50kHz reference frequency; maximum frequency 50MHz; variable amplitude.	Check horizontal, vertical and trigger bandwidth.	
2. Standard Amplitude Calibrator	Amplitude accuracy: 0.25%, variable amplitude; 5mV to 40V; frequency: 1 kHz square wave.	Check horizontal and vertical gain.	
3. Square-wave Generator	Variable frequency; 10 Hz to 1 MHz; output amplitude; 10 mV to 100 V	Check probe and vertical compensation.	
4. Digital Multimeter	0.1% accuracy.	Check power supply	
5. Time Mark Generator	0.1% accuracy.	Check horizontal timing.	
6. Cable	Impedance, 50 ohms; type, RG-58/U; length, 42 inches, connectors, BNC.	External trigger operation check. Horizontal gain check and adjustment.	Hitachi Part No.4202
7. Termination	Impedance, 50 ohms; connectors, BNC	Vertical Amplifier compensation checks and adjustment.	
8. Attenuator	Ratio, 10X; connectors, BNC; impedance, 50 ohms.	Vertical Amplifier bandwidth check.	
9. T-Connector	Connectors, BNC.	External trigger operation checks.	Hitachi Part No.1301

4.2 PRELIMINARY PROCEDURE

This instrument should be calibrated at an ambient temperature of +20°C (±5°C) for best overall accuracy.

1. Connect the instrument to AC line voltage, 50/60 Hz line source.
2. Set the instrument controls as given in the Preliminary Control Settings. Allow at least fifteen minutes of warmup before proceeding.
3. See the Adjustment Locations in the pull-outs.

4.3 PRELIMINARY CONTROL SETTING

Preset the instrument controls to the settings given below, when starting the calibration procedures.

	V-202	V-352
FOCUS	Midposition	Midposition
TRACE ROTATION	Midposition	Midposition
V.POSITION	Midposition, push in	Midposition, push in
V.VARIABLE	CAL, fully clockwise	CAL, fully clockwise
AC-GND-DC	GND	GND
VOLTS/DIV		
V.MODE	CH1	CH1
TIME/DIV	1ms	1ms
SWP VAR	CAL, fully clockwise	CAL, fully clockwise
H.POSITION	Midposition, push in	Midposition, push in
Trig. LEVEL	Midposition, push in	Midposition, push in
Trig. MODE	AUTO	AUTO
Trig. SOURCE	CH1	CH1

Table 4-2
PRELIMINARY CONTROL SETTING.

4.4 INITIAL STARTING PROCEDURE

1. Rotate POWER/INTENSITY control to the midposition.
2. Wait a few seconds for the cathode ray tube (CRT) to warm up. A trace should appear on the fact of the CRT.
3. If no trace appears, increase (clockwise) the POWER/ INTENSITY control setting until the trace is easily observed.
4. Adjust FOCUS control for the thinnest, sharpest trace.
5. Readjust POSITION controls if necessary, to center the trace.

POWER SUPPLY SYSTEM

NOTE

Before you begin, see ADJUSTMENT LOCATIONS in the pullout pages

Control Settings

Preset the controls as given in the Preliminary Control Setting.

① Check Low-voltage Supply, if necessary

a. Connect the digital voltmeter (DVM) from the +5 volt line.
:+5V ±0.2V (IC1131)

b. Connect the DVM from the +12V line
:+12V ±0.5V (IC1111)

c. Connect the DVM from the -12V line
:-12V ±0.5V (IC1121)

d. Connect the DVM from the +150V/+100V
:+150V $^{+16V}_{-2V}$ V-202
:+100V $^{+11V}_{-5V}$ V-352

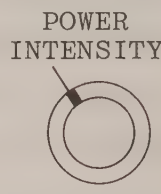
② Check High Voltage Supply

a. Connect the DVM to the H.V test point

b. Check for a reading of -1900V ±100V V-202
-1350V ±70V V-352

③ Check/Adjust Grid Bias

a. Rotate the POWER/INTENSITY to the 1/3 of fully way as shown.



b. Observe the trace of CRT.

c. Adjust Grid Bias Adjustment RV1021 for the trace makes an appear.

DISPLAY

Control Setting

Preset the controls as given in the Preliminary Control Setting.

④ Check/Adjust ASTIG matism and FOCUS.

a. Set the TIME/DIV switch to the X-Y position, and Vertical MODE switch to the CH2/ X-Y position.

b. Set the POWER/INTENSITY control for a small spot, near center of screen using position controls.

c. Check that the spot is round.

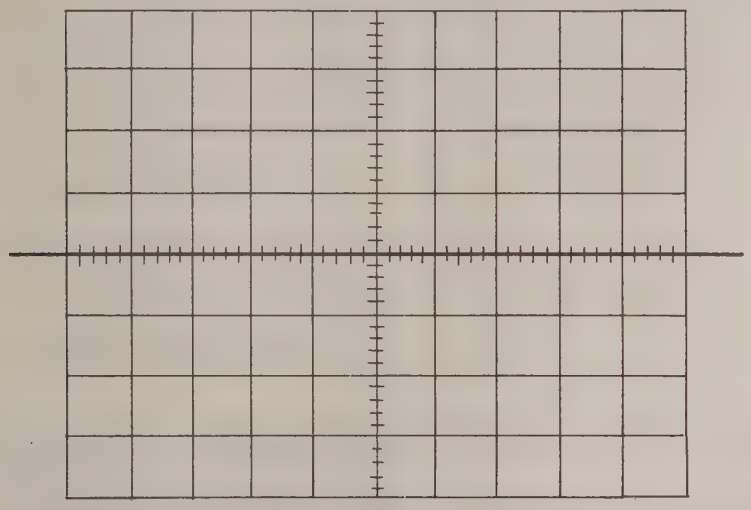
d. Adjust the FOCUS adjustment and the ASTIG adjustment RV1035 for a round spot.

⑤ Check/Adjust Trace Rotation

a. Set the TIME/DIV switch to 1ms.

b. Check that the trace is parallel to the center horizontal line.

d. Adjust TRACE ROTATION for a trace that is parallel with the horizontal graticule lines.



⑥ Check/Adjust GEOMetry

a. Set the TIME/DIV switch to the 1ms, and AC-GND-DC switch to DC.

b. Connect the Constant Amplitude Signal Generator to the input.

c. Set the VOLTS/DIV switch setting for a full-screen (8 division) deflection.

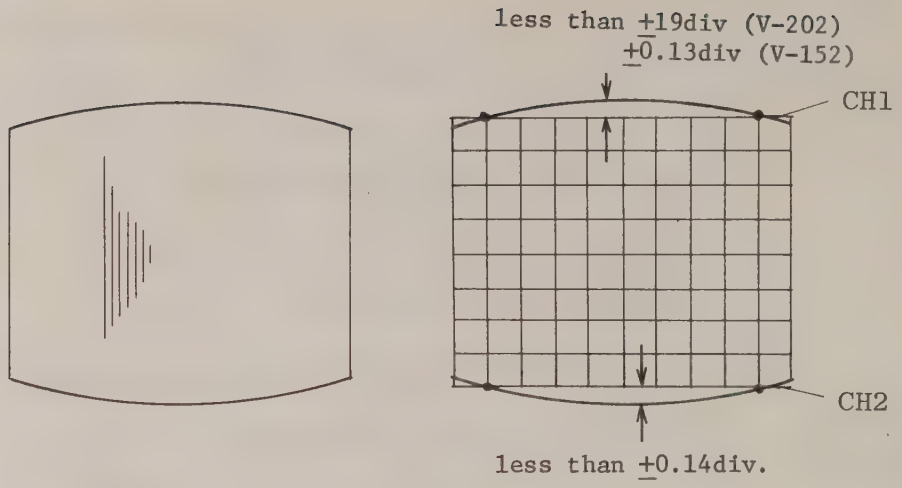
d. Check that horizontal bowing is less than ±0.19 division, V-202, ±0.13 division (V-352)

e. Adjust the GEOM adjustment RV1034 for a display that is parallel with top and bottom horizontal lines.

NOTE;

Also it is possible the adjustment of GEOM as follow.

a. Set the vertical MODE to the DUAL.



b. Rotate the POSITION (CH1) control to the top the trace

c. Rotate the POSITION (CH2) control to the bottom the trace

d. Check and Adjust as before method.

VERTICAL SYSTEM

Control Setting

Preset the controls as given in the Preliminary Control Settings.

⑦ Check/Adjust DC Balance (Step attenuator balance).

a. Set the VOLTS/DIV switch to the 5mV position.

b. Position the trace to the horizontal center line.

c. Change the VOLTS/DIV switch to the 10mV position.

d. Check that the trace is within 0.1 division of the center horizontal line.

e. Adjust the DC BAL adjustment, RV19(CH1) or RV119(CH2), for a trace at the horizontal center line.

f. Repeat part (a) through (e) until less than 0.05 division shift is noted when changing the VOLTS/DIV setting.

⑧ Check/Adjust Vertical Position Center.

a. Confirm the vertical POSITION control at the midposition.

b. Check the trace is within 1 division.

c. Adjust the Position Center adjustment RV54(CH1), RV154(CH2) for a trace at the horizontal center line.

⑨ Check/Adjust AC GAIN

a. Set the TIME/DIV switch to the 1ms position.

b. Set the VOLTS/DIV switch to the 5mV position.

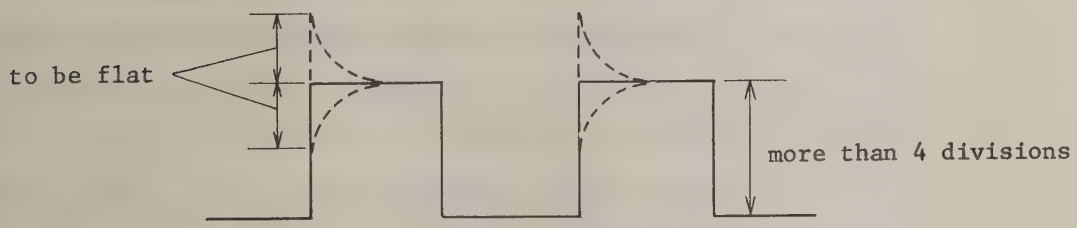
c. Set the AC-GND-DC switch to DC.

d. Connect the Square-wave Generator (using 1KHz out put range).

e. Adjust the output amplitude of that generator for more than 4 division deflection of screen.

f. Check the high-voltage level of pulse is flat.

g. Adjust the AC GAIN RV32(CH1), RV132(CH2) adjustment for a flat level.



⑩ Check/Adjust Vertical Gain.

a. Set the VOLTS/DIV switch to the 5mV position and AC-GND-DC switch to DC.

b. Connect the standard amplitude calibrator to the input.

c. Set the standard amplitude calibrator for a $20mV_{p-p}$ (4 divisions of display) signal.

d. Check for a display of four divisions.

e. Adjust RV53(CH1), RV153(CH2) for a display of 4 divisions within 3%.

f. Check all the VOLTS/DIV switch settings.

⑪ Check/Adjust CAL terminal ($0.5V_{p-p}$).

a. Set the VOLTS/DIV switch to the 0.1V position.

b. Connect the CAL to the input.

c. Check for a display of five divisions.

d. Adjust RV1203 for a display of 5 divisions within 3%.

⑫ Check/Adjust Attenuation Compensation.

a. Set the VOLTS/DIV switch to the 0.1V position and AC-GND-DC switch to DC.

b. Connect the square-wave generator to the input for a 0.5V (1KHz) signal.

c. Check for a square wave that is flat (flat top).

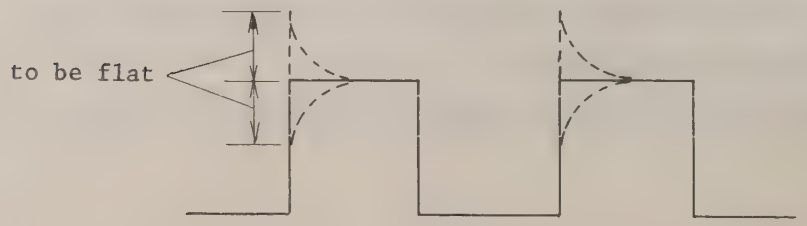
d. Adjust CV5(CH1), CV105(CH2) for a square wave that is flat (flat top).

e. Set the VOLTS/DIV switch to the 1V position.

f. Set the square-wave generator for a 5V (1KHz) signal.

g. Check for a square wave that is flat.

h. Adjust CV10(CH1), CV110(CH2) for a square wave that is flat.



⑬ Check/Adjust Probe Compensation.

a. Set the VOLTS/DIV switch to the 5mV position.

b. Connect the square-wave generator to the input. Use a plobe AF1.5.(at ×10 position)

c. Set the square-wave generator for a 0.2V signal.

d. Adjust the LEVEL control for a stable display, triggered on the positive excursion of the waveform.

e. Check that positive excursion of the displayed square wave is flat (flat top).

f. Adjust the trimmer capacitance of that plobe the display is flat.

g. Set the VOLTS/DIV switch to the 0.1V position.

h. Set the square-wave generator for a 5V signal.

i. Check for a square wave that is flat.

j. Adjust CV4(CH1), CV104(CH2) for a square wave that is flat.

k. Set the VOLTS/DIV switch to the 1V.

l. Set the square-wave generator for a 50V signal.

m. Check for a square wave that is flat.

n. Adjust CV9(CH1), CV109(CH2) for a square-wave that is flat.

⑭ Check/Adjust Vertical Step Response.

a. Set the VOLT/DIV switch to the 5mV position.

b. Set the TIME/DIV switch to the 5μs position, if necessary, to the 2μs position setting.

c. Pull the ×10 MAG switch out for a magnified display.

d. Connect the first-rise, positive output of the square-wave generator to input. Use a 50-ohm termination and cable.

e. Set the square-wave generator to 100kHz. Adjust the square wave generator output for a 4-divisions display.

f. Position the positive-going signal in the center of the graticule, with the top of the square wave visible.

g. Adjust CV334 and CV316 for a square wave that is flat. (A slight readjustment of the CV316 might be necessary for a flat top with 0 ~ +8% over-shoot.)

And adjust CV352, 359 for over shoot that is +0.1 div.

h. Check and adjust CV52(CH1), CV152(CH2) for its balanced.

⑮ Check/Adjust Vertical Bandwidth.

a. Set the VOLTS/DIV switch to 5mV, the TIME/DIV switch to 1ms.

b. Connect the constant amplitude signal generator to the input. Use a 50-ohm termination.

c. Set the constant amplitude signal generator to 50kHz, and adjust the output amplitude of it for a deflection of eight divisions.

d. Adjust the frequency of the constant amplitude signal generator until 5.6 divisions of deflection are present on the CRT screen.

e. Check that the frequency of the constant amplitude signal generator is greater than 20 MHz(V-202), 35MHz (V-352).

f. Adjust item 14 for deflection of at least 5.6 divisions at 20MHz(V-202), 35MHz(V-352). Check display for a clean step response.

Control Settings

Preset the controls as given in the Preliminary Control settings.

⑯ Check/Adjust Horizontal Gain (Sweep Cal.)

a. Set the TIME/DIV switch to the 1ms.

b. Set the horizontal gain for a ×1 MAG.

c. Set the input AC-GND-DC switch to DC.

d. Connect the cable to the output of the time mark generator.

e. Set the time mark generator for 1ms time marks.

f. Check that the time marks align with the graticule lines over the center eight divisions.

g. Adjust RV830 at that the time marks align with the center eight graticule lines.

h. Check all other ranges of timing within 3%. Use appropriate settings on the time mark generator.

i. Set ×10 MAG (pull out).

j. Adjust RV831 for one-cycle time marks align with the ten-divisions graticule lines.

k. Check all the TIME/DIV switch settings.

⑰ Check/Adjust High speed sweep accuracy.

a. Set the TIME/DIV switch to the 10μs.

b. Set the horizontal gain for a ×1 Mag.

c. Set the time marker for 10 μs.

d. Check that the time marks align with the graticule lines as ⑯ .

e. Adjust CV510.

⑱ Check/Adjust X Gain.

a. Set the TIME/DIV switch to [X-Y].

b. Set the AC-GND-DC switch of CH1 to AC, the AC-GND-DC switch of CH2 to GND.

c. Set the VOLTS/DIV switch to the 5mV position, with ×1 GAIN.

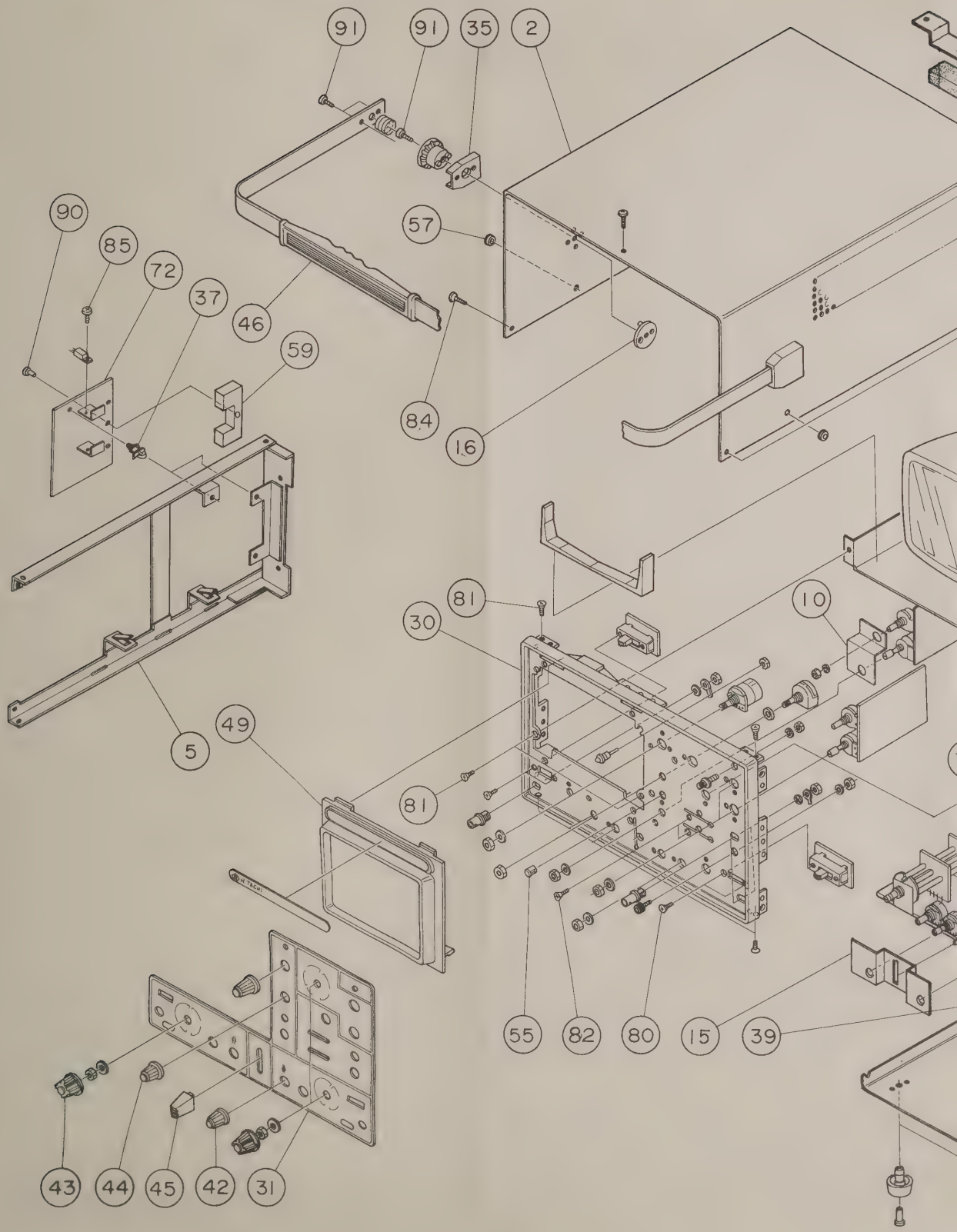
d. Connect the standard amplitude calibrator to the CH1 input.

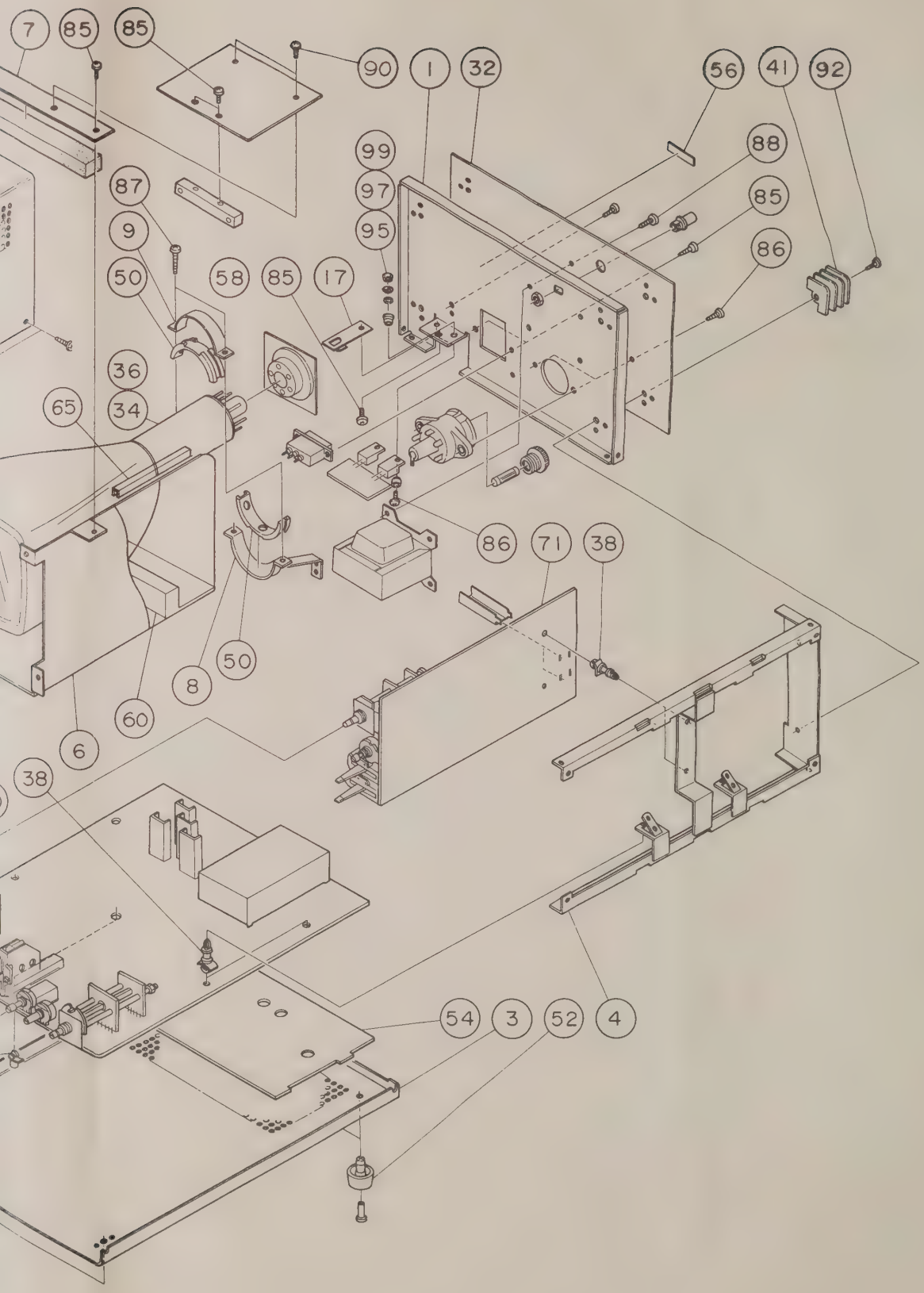
e. Set the standard amplitude calibrator for a 20 mV.

f. Check for a display of 4 divisions.

g. Adjust RV804 for a display of four divisions.

Disassembly illustration

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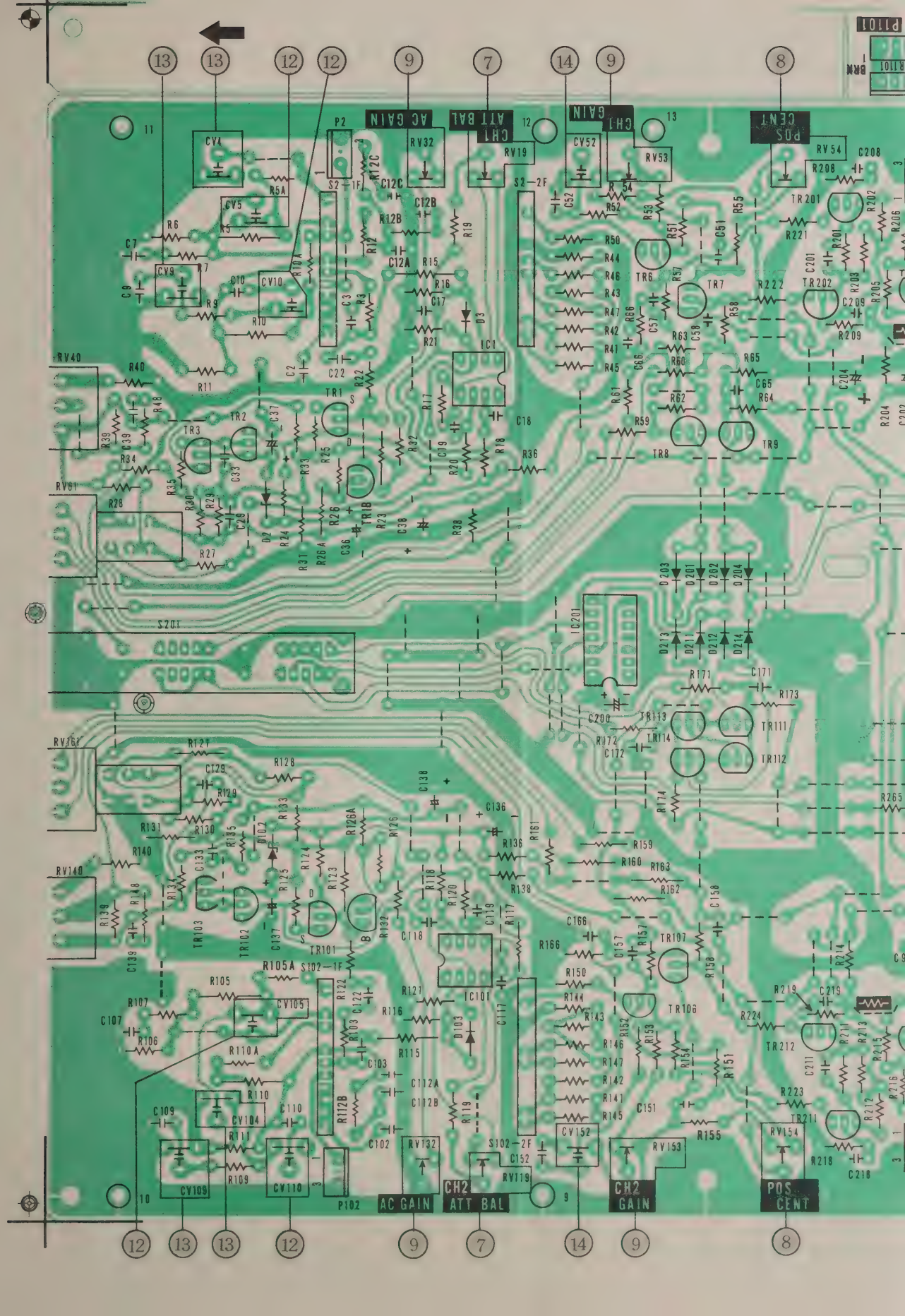
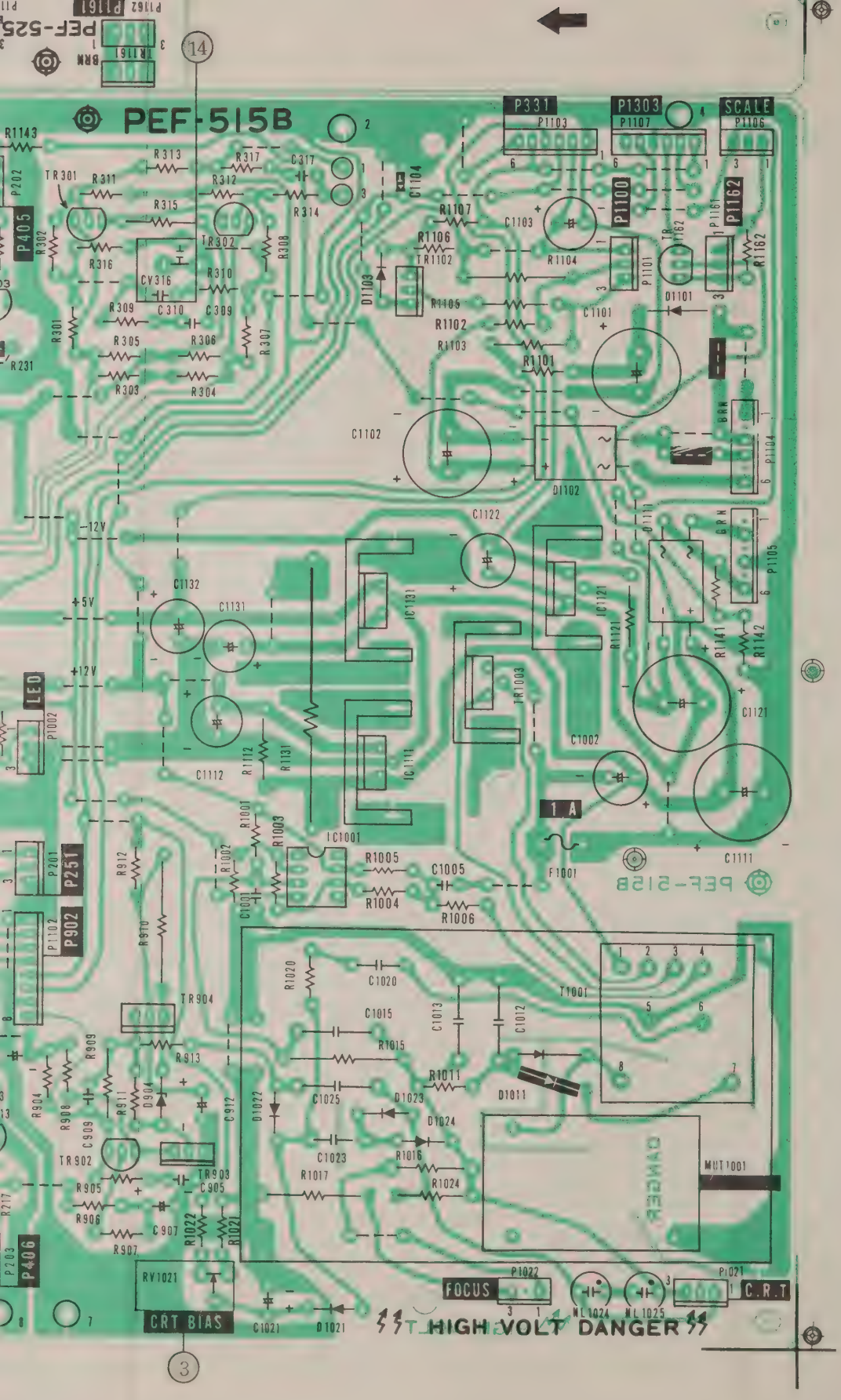
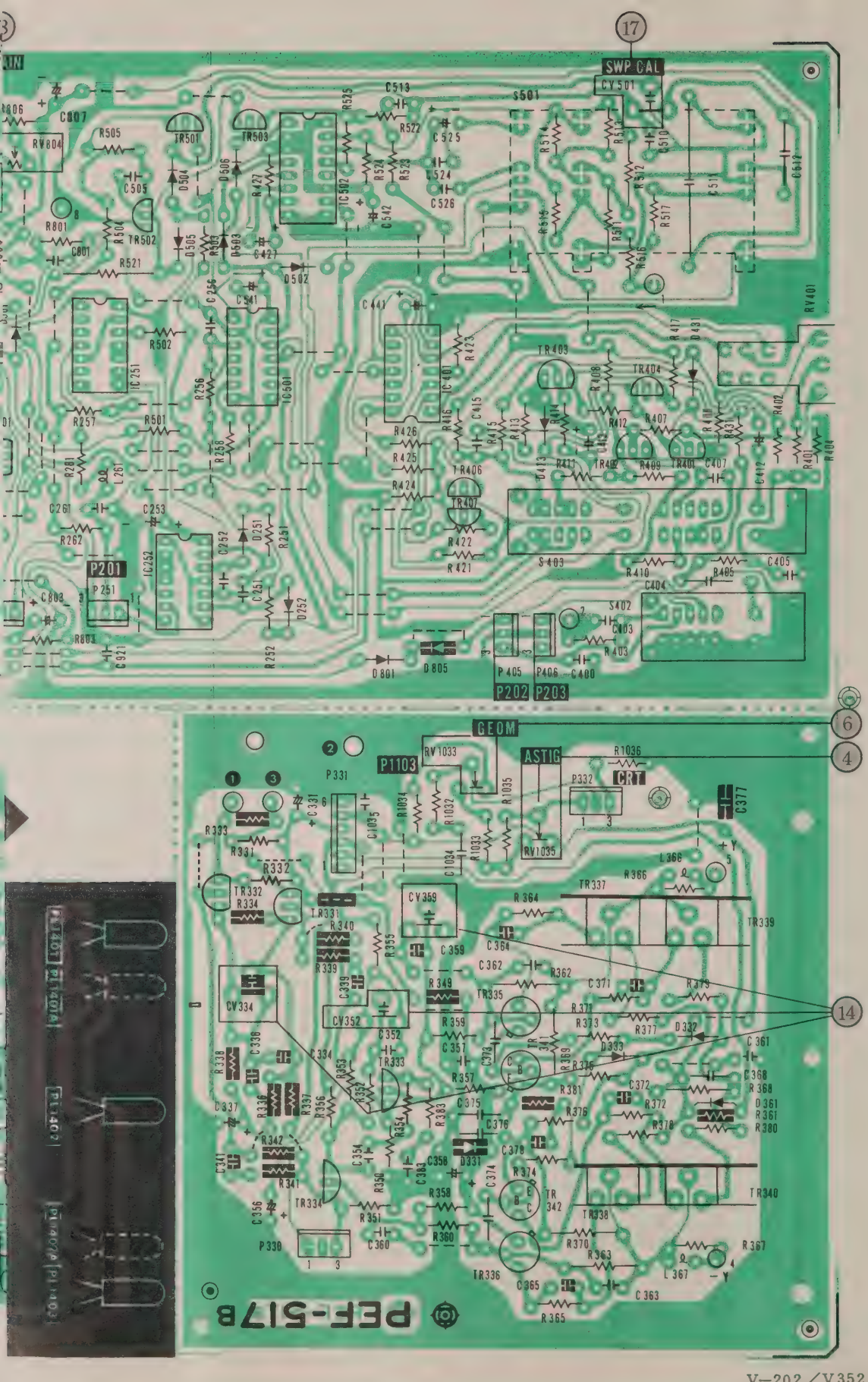
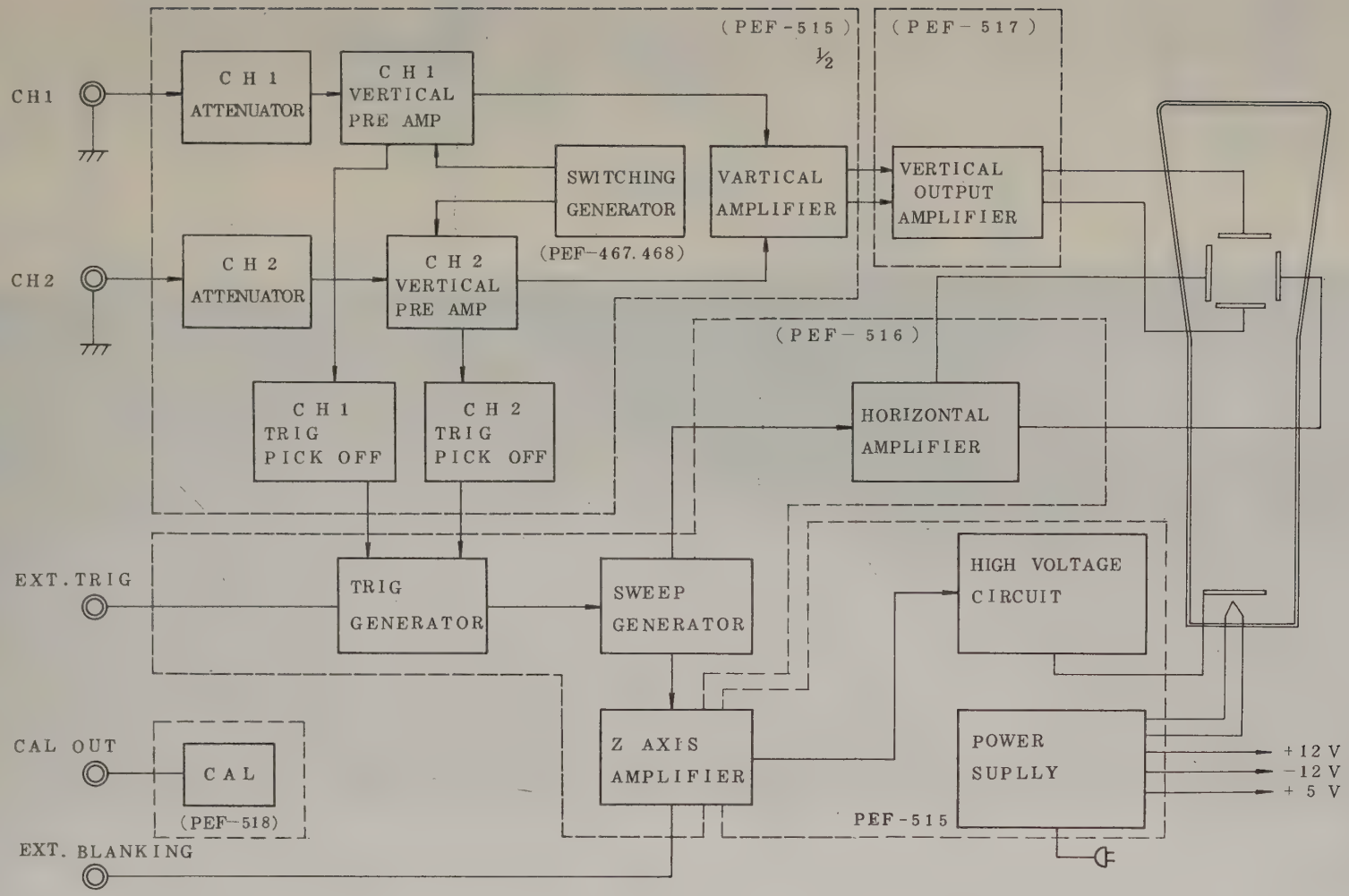

AC GAIN
CH1 ATT BAL
CH1 GAIN
POS CENT
CH2 ATT BAL
CH2 GAIN
POS CENT
P102
P1101
S102-1F
S102-2F
IC1
IC101
IC201
TR1
TR2
TR3
TR6
TR7
TR8
TR9
TR101
TR102
TR103
TR106
TR107
TR111
TR112
TR113
TR114
TR201
TR202
TR211
TR212
D2
D3
D102
D103
D201
D202
D203
D204
D211
D212
D213
D214
RV32
RV40
RV54
RV61
RV119
RV121
RV140
RV152
RV153
RV154
CV4
CV5
CV9
CV10
CV104
CV105
CV109
CV110
P2
S201


PEF-515B
P331
P1303
SCALE
P1100
P1162
P405
P406
P251
P902
LED
FOCUS
CRT BIAS
C.R.T
1 A
F1001
T1001
IC1001
IC1111
IC1131
IC1121
TR1003
TR301
TR302
TR904
TR902
TR903
D1101
D1102
D1011
D1021
D1022
D1023
D1024
MUT1001
NL1024
NL1025
-12V
+5V
+12V
HIGH VOLT DANGER

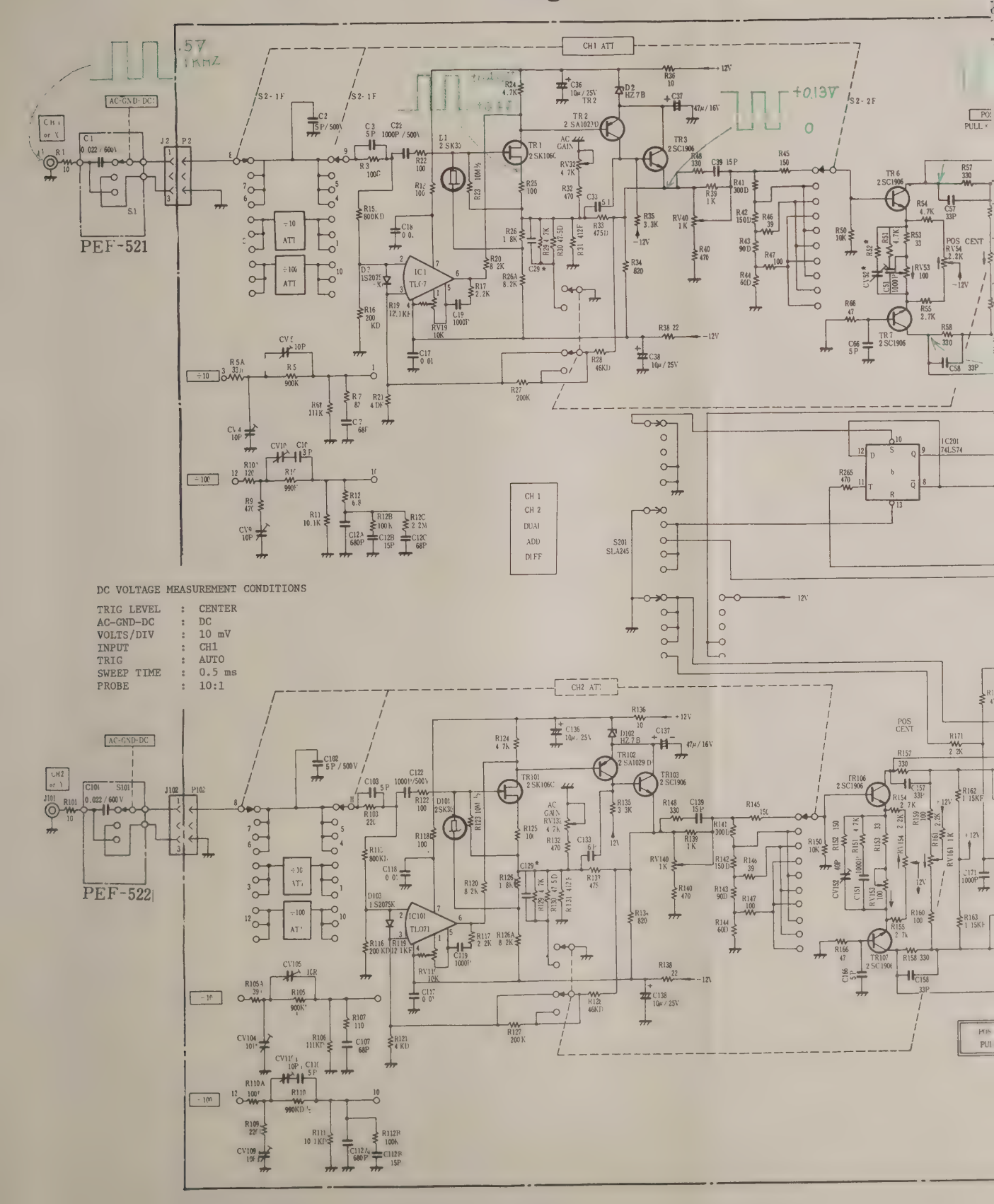
PEF-516B
MAG GAIN
H GAIN
INTEN
EXT BLANKING
V-202
V-352
PEF-519B
PEF-520B
140BMB31R
140DFB31
PEF-518B
CAL 5V
PEF-521B
PEF-522B
PEF-523B
PEF-524B
ROT COIL
P1107
P1303
P1001
P802
P801
P1102
P902
P905
TR847
TR853
TR857
TR846
TR852
TR856
TR901
D853
D852
D802
D803
D901
D902
D903
D1301
D1302
D1303
D1304
L854
L850
+12V
-12V
R855
R845
R859
R851
R849
R853
R847
R863
R857
R843
R861
R842
R854
R844
R864
R850
R848
R852
R846
R862
R858
R815
R814
R809
R808
R802
R830
R813
R831
R807
R805
R832
R860
R828A
R829
R804
R903
R902
R901
R803A
C855
C847
C845
C863
C849
C862
C854
C844
C846
C832
C860
C920
C903
C878
RV831
RV830
RV815
RV1203
RV1026
RV1303
C1202
C1203
R1202
R1201
C1201
R1023
R1204
C1204
R518
RV518
C1304
C1303
R1303
C1
C101
S1
S101
P1102
P802
P801
6MD
CAL
16
11


SWP CAL
CY501
S501
C513
R535
R522
C525
C524
C526
R524
R523
IC502
C542
TR501
TR503
D504
D506
R505
C505
R427
TR502
D505
D503
R503
C427
R801
C801
R521
D502
C256
C541
C441
R502
IC251
IC601
R256
R257
R501
R258
R281
L261
C261
R262
C253
C252
IC252
D251
R251
C251
D252
R252
P201
P251
C803
R803
C921
D801
D805
P405
P406
C400
P202
P203
S403
S402
C403
R403
R426
R425
R424
R423
IC401
C415
R416
R415
R413
R414
R412
R407
R408
R409
R410
R411
R405
C405
C404
C407
C412
R401
R402
R404
R417
D431
RV401
TR403
TR404
TR405
TR406
TR407
TR401
C413
R421
R422
GEOM
RV1033
P1103
ASTIG
R1036
P332
CRT
C377
RV1035
R1034
R1032
R1035
R1033
C1034
C1035
P331
C331
R333
R331
R332
TR332
R334
TR331
R340
R339
C339
CV334
CV352
C352
P334
TR333
R353
R352
R338
C338
R336
R337
R335
D337
C341
R342
R341
C354
C356
P330
C360
R350
R351
TR334
C383
C358
D331
C374
R374
TR342
TR336
R358
R360
C365
R365
C363
R363
R370
TR338
TR340
R367
L367
C359
C364
CV359
R355
R364
TR337
L368
R366
TR339
C362
R362
TR335
R349
R359
C357
C375
R383
R354
C376
R357
R381
C378
R376
C371
R379
R373
R377
D332
D333
R369
C372
R372
R378
C361
C368
R368
D361
R361
R380
PEF-517B
PL1402
PL1403
PL1404
PL1405



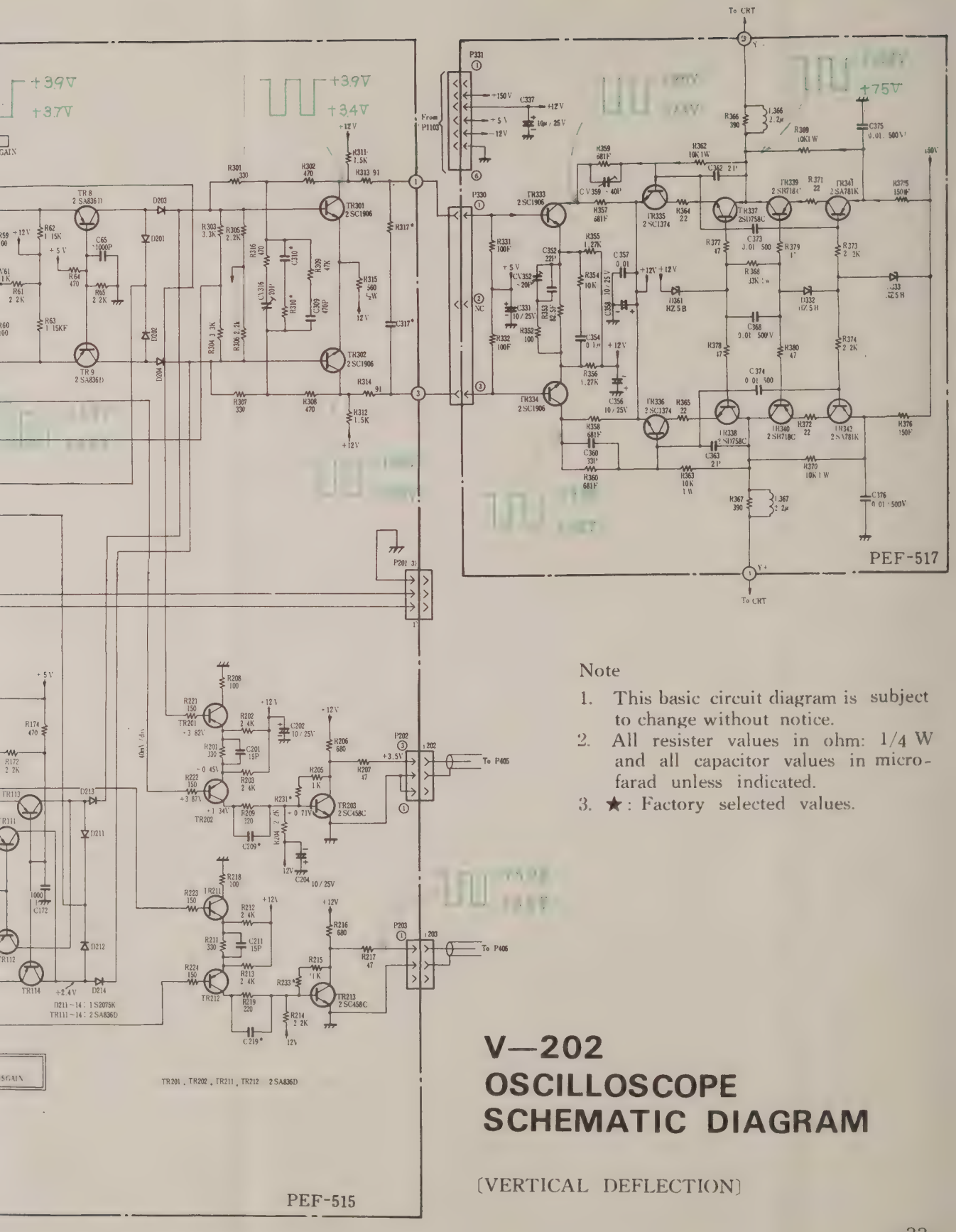
BLOCK DIAGRAM

Schematic diagram



DC VOLTAGE MEASUREMENT CONDITIONS

TRIG LEVEL	:	CENTER
AC-GND-DC	:	DC
VOLTS/DIV	:	10 mV
INPUT	:	CH1
TRIG	:	AUTO
SWEEP TIME	:	0.5 ms
PROBE	:	10:1



Note

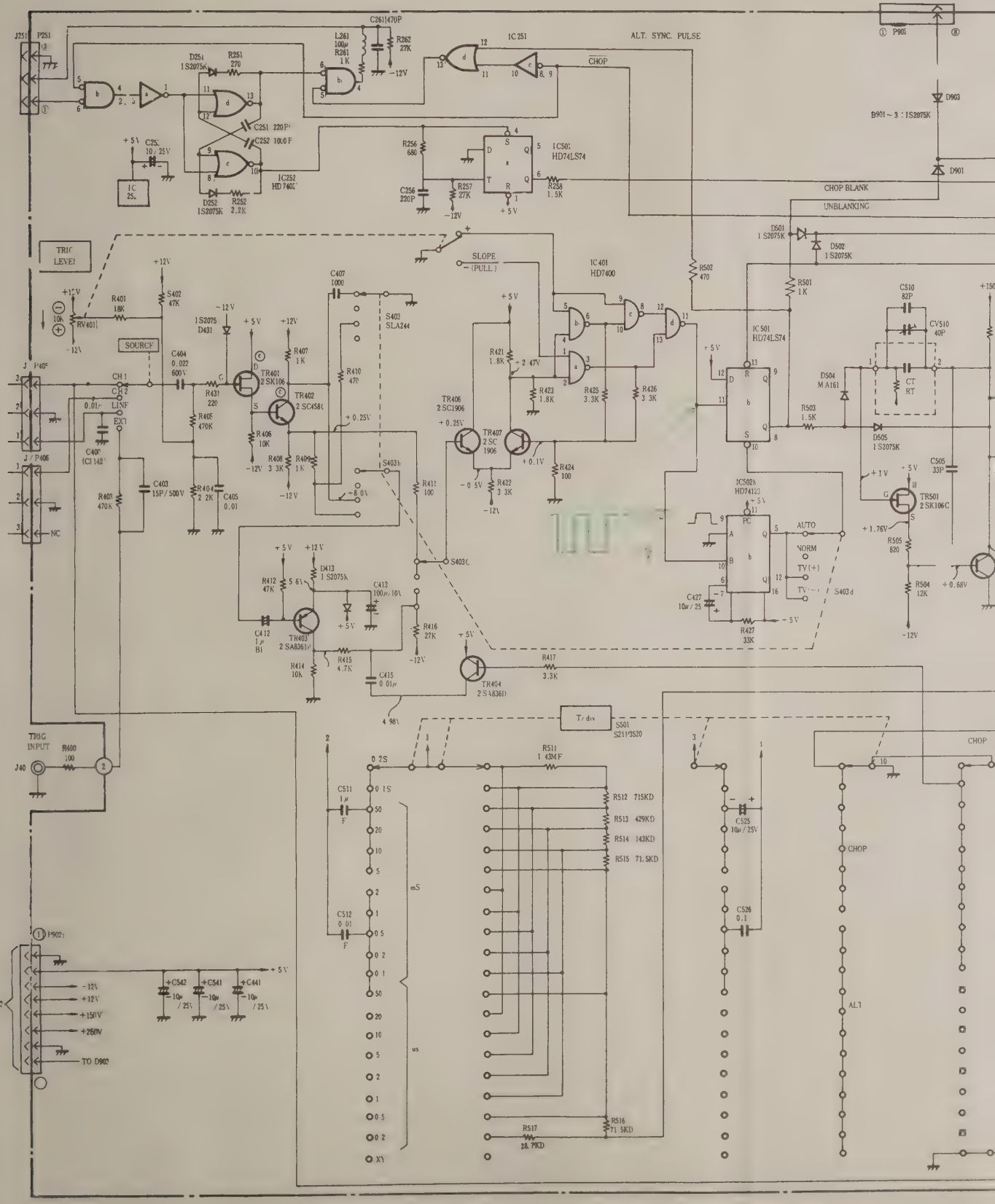
1. This basic circuit diagram is subject to change without notice.
2. All resister values in ohm: 1/4 W and all capacitor values in micro-farad unless indicated.
3. ★: Factory selected values.

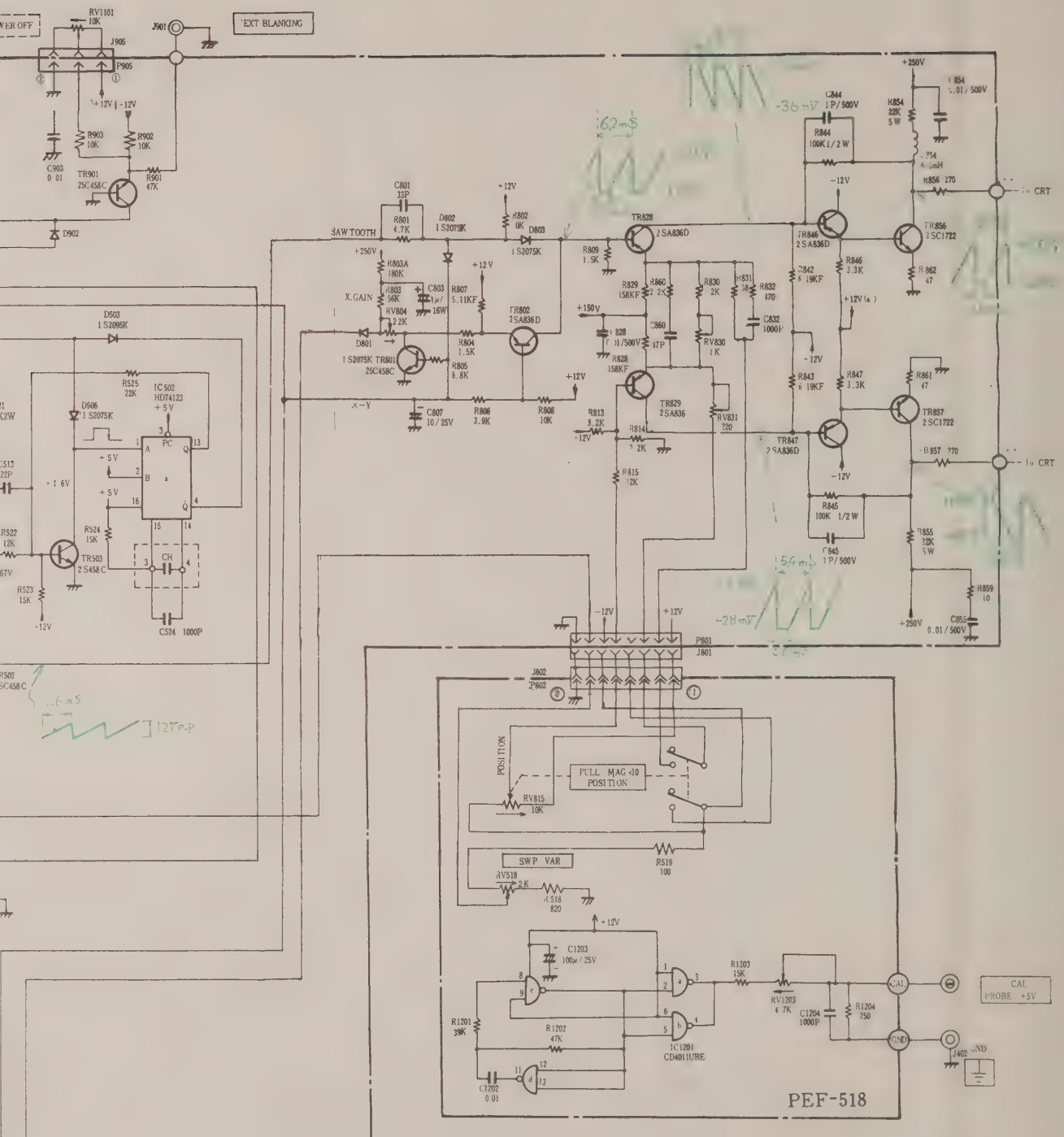
V—202 OSCILLOSCOPE SCHEMATIC DIAGRAM

[VERTICAL DEFLECTION]

Note

1. This basic circuit diagram is subject to change without notice.
2. All resister values in ohm: 1/4 W and all capacitor values in microfarad unless indicated.
3. ★: Factory selected values.

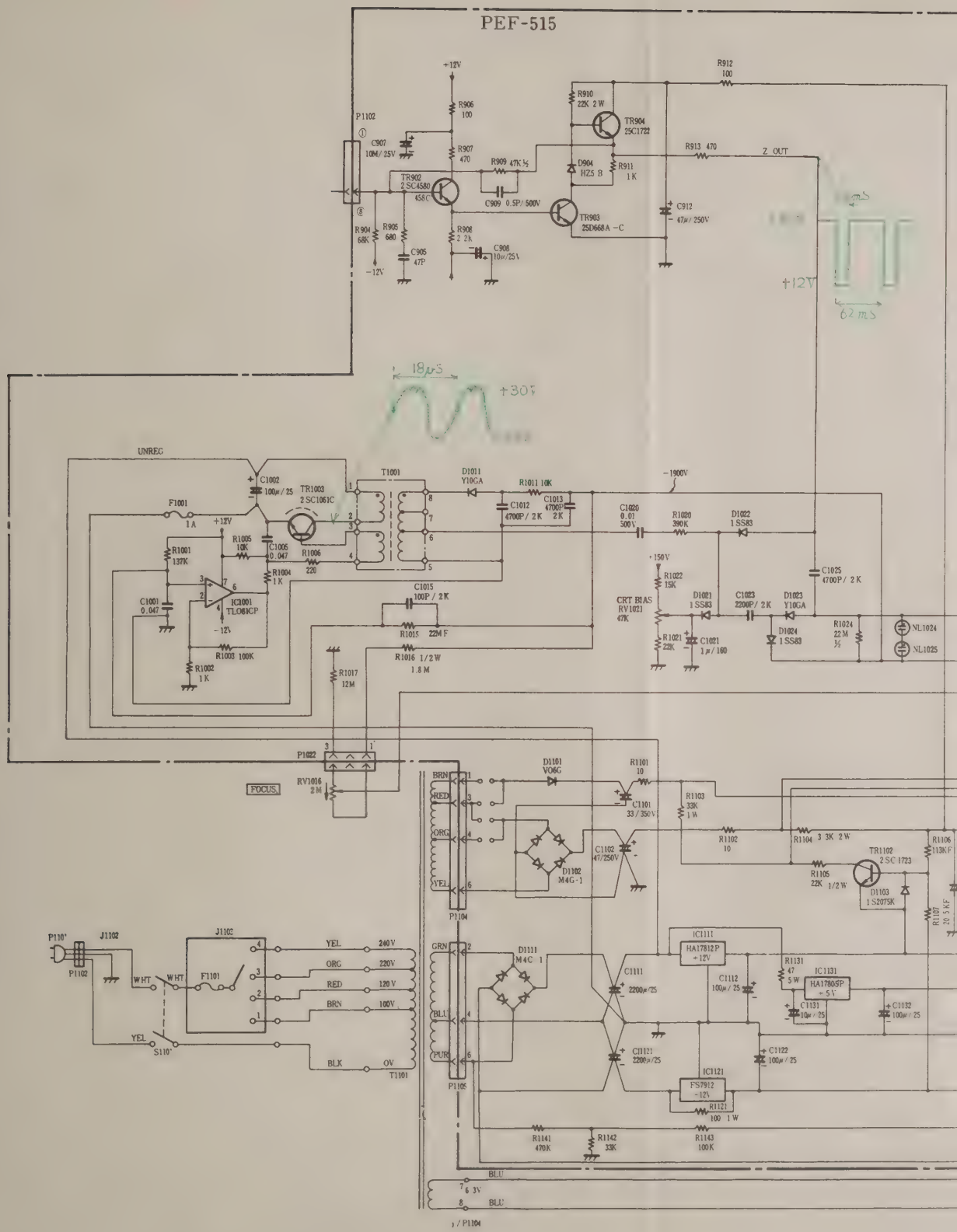


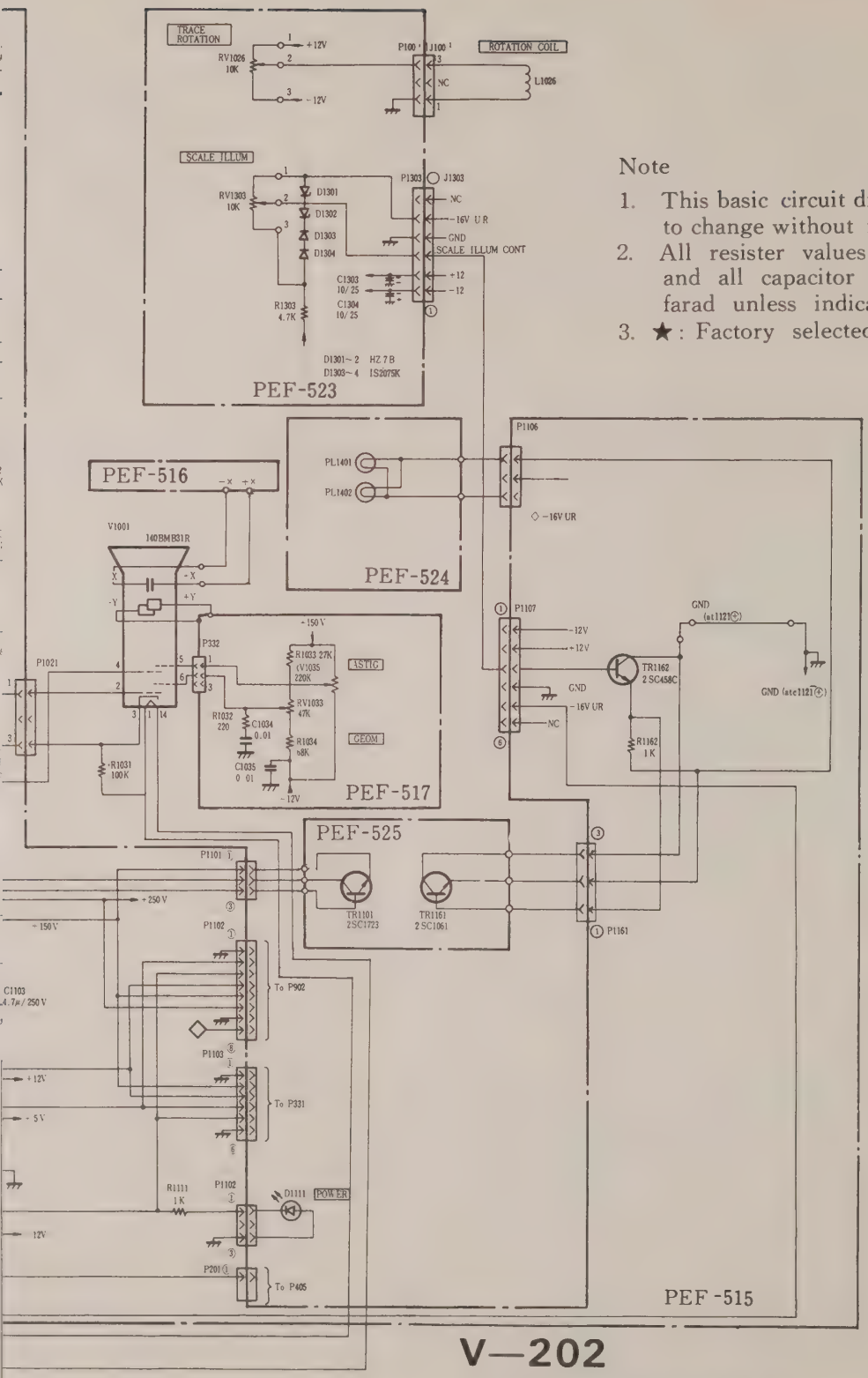


V—202
OSCILLOSCOPE
SCHEMATIC DIAGRAM

(HORIZONTAL DEFLECTION, TRIGGERING AND CAL

PEF-515


+12V
R912 100
R910 22K 2W
TR904 2SC1722
P1102
C907 10M/25V
R906 100
R907 470
R909 47K ½
D904 HZ5 B
R911 1K
R913 470
Z OUT
TR902 2SC4580
C909 0.5P/500V
TR903 2SD668A -C
C912 47μ/250V
R904 68K
R905 680
C905 47P
R908 2.2k
C908 10μ/25V
-12V
18μS
+30V
62mS
UNREG
C1002 100μ/25
TR1003 2SC1061C
F1001 1A
T1001
D1011 Y10GA
R1011 10K
C1012 4700P/2K
C1013 4700P 2K
-1900V
C1020 0.01 500V
R1020 390K
D1022 1SS83
+150V
R1022 15K
C1025 4700P/2K
CRT BIAS RV1021 47K
D1021 1SS83
C1023 2200P/2K
D1023 Y10GA
R1024 22M ½
D1024 1SS83
R1021 22K
C1021 1μ/160
NL1024
NL1025
R1001 137K
R1005 10K
C1005 0.047
R1006 220
R1004 1K
C1001 0.047
IC1001 TL081CP
R1003 100K
R1002 1K
C1015 100P/2K
R1015 22M F
R1016 1/2W 1.8M
R1017 12M
P1022
FOCUS
RV1016 2M
D1101 VO6G
R1101 10
C1101 33/350V
R1103 33K 1W
R1102 10
R1104 3 3K 2W
TR1102 2SC1723
R1105 22K 1/2W
D1103 1S2075K
R1106 113KF
R1107 20 5KF
C1102 47/250V
D1102 M4G-1
BRN
RED
ORG
YEL
P1104
GRN
BLU
PUR
D1111 M4C 1
C1111 2200μ/25
C1112 100μ/25
IC1111 HA17812P +12V
R1131 47 5W
IC1131 HA17805SP +5V
C1131 10μ/25
C1132 100μ/25
C1121 2200μ/25
C1122 100μ/25
IC1121 FS7912 -12V
R1121 100 1W
P1105
R1141 470K
R1142 33K
R1143 100K
BLU
6.3V
BLU
P1104
P1102
J1102
WHT
F1101
S110
YEL
J1103
240V
220V
120V
100V
0V
BLK
T1101

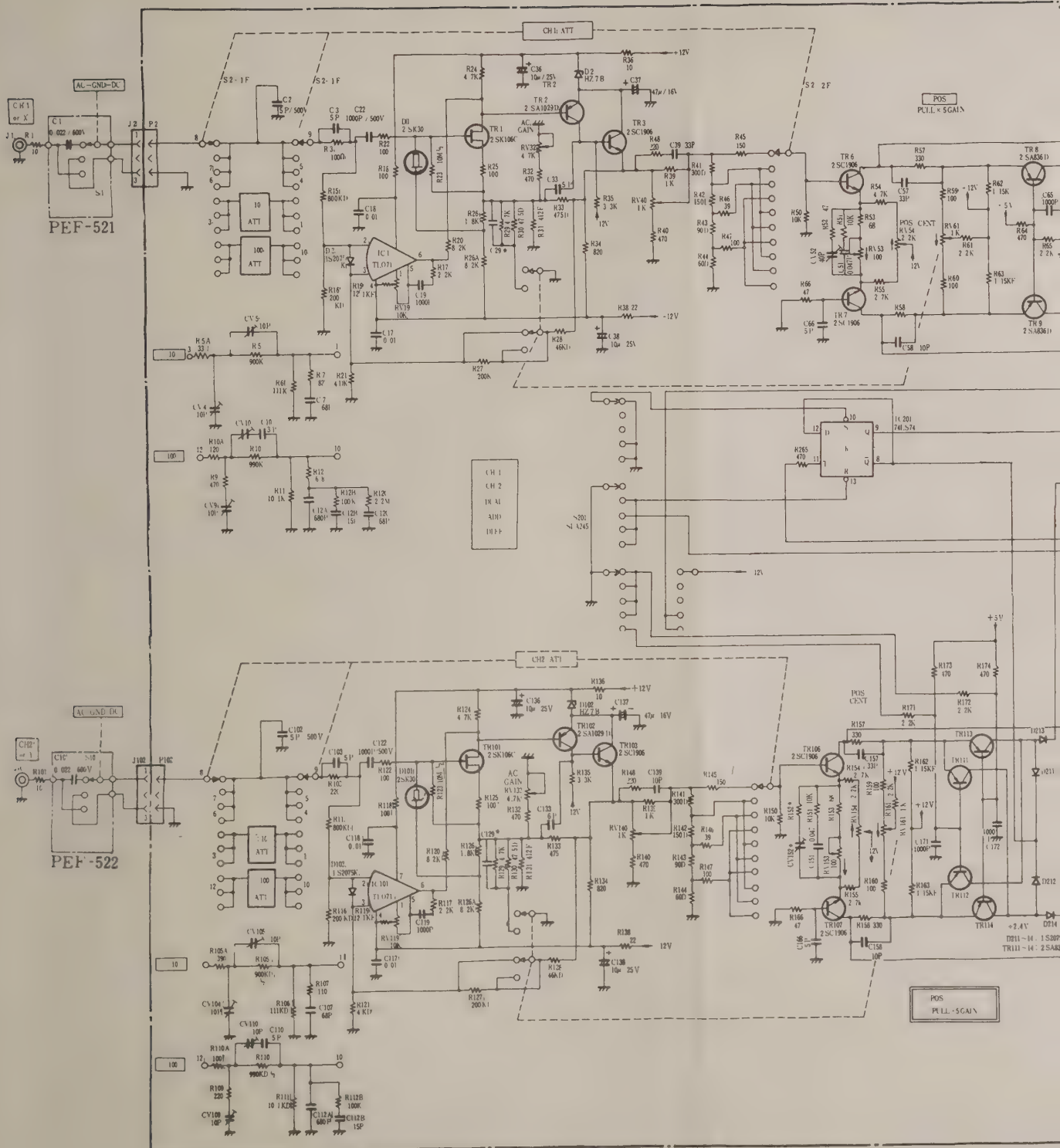


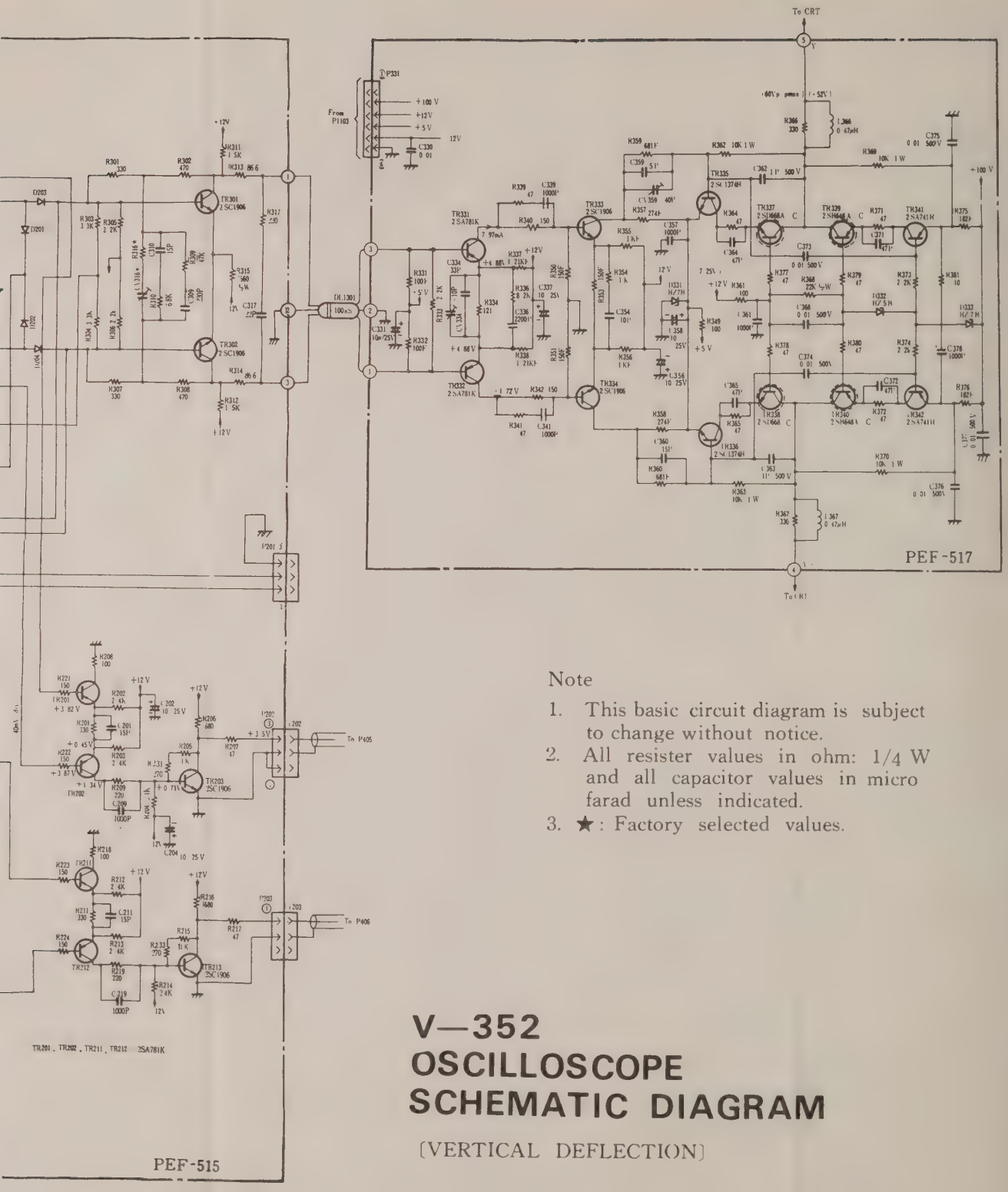
Note

1. This basic circuit diagram is subject to change without notice.
2. All resister values in ohm: 1/4 W and all capacitor values in micro-farad unless indicated.
3. ★: Factory selected values.

V—202 OSCILLOSCOPE SCHEMATIC DIAGRAM

[POWER SUPPLY, HIGH VOLTAGE AND C.R.T CONTROLES]


CH1 ATT
AC-GND-DC
PEF-521
CH1 or X
S2-1F
S2-2F
POS
PULL×5GAIN
TR1 2SK106
TR2 2SA1029
TR3 2SC1906
TR6 2SC1906
TR7 2SC1906
TR8 2SA836
TR9 2SA836
IC1 TL071
D1 2SK30
D2 HZ7.5
D3 1S2076
10 ATT
100 ATT
POS CENT
AC GAIN
CH1
CH2
DUAL
ADD
INV
IC201 74LS74
CH2 ATT
AC-GND-DC
PEF-522
TR101 2SK106
TR102 2SA1029
TR103 2SC1906
TR106 2SC1906
TR107 2SC1906
TR111
TR112
TR113
TR114
D1101 HZ7.5
D1102 HZ7.5
D1102 1S2076K
IC101 TL071
POS CENT
POS PULL×5GAIN



Note

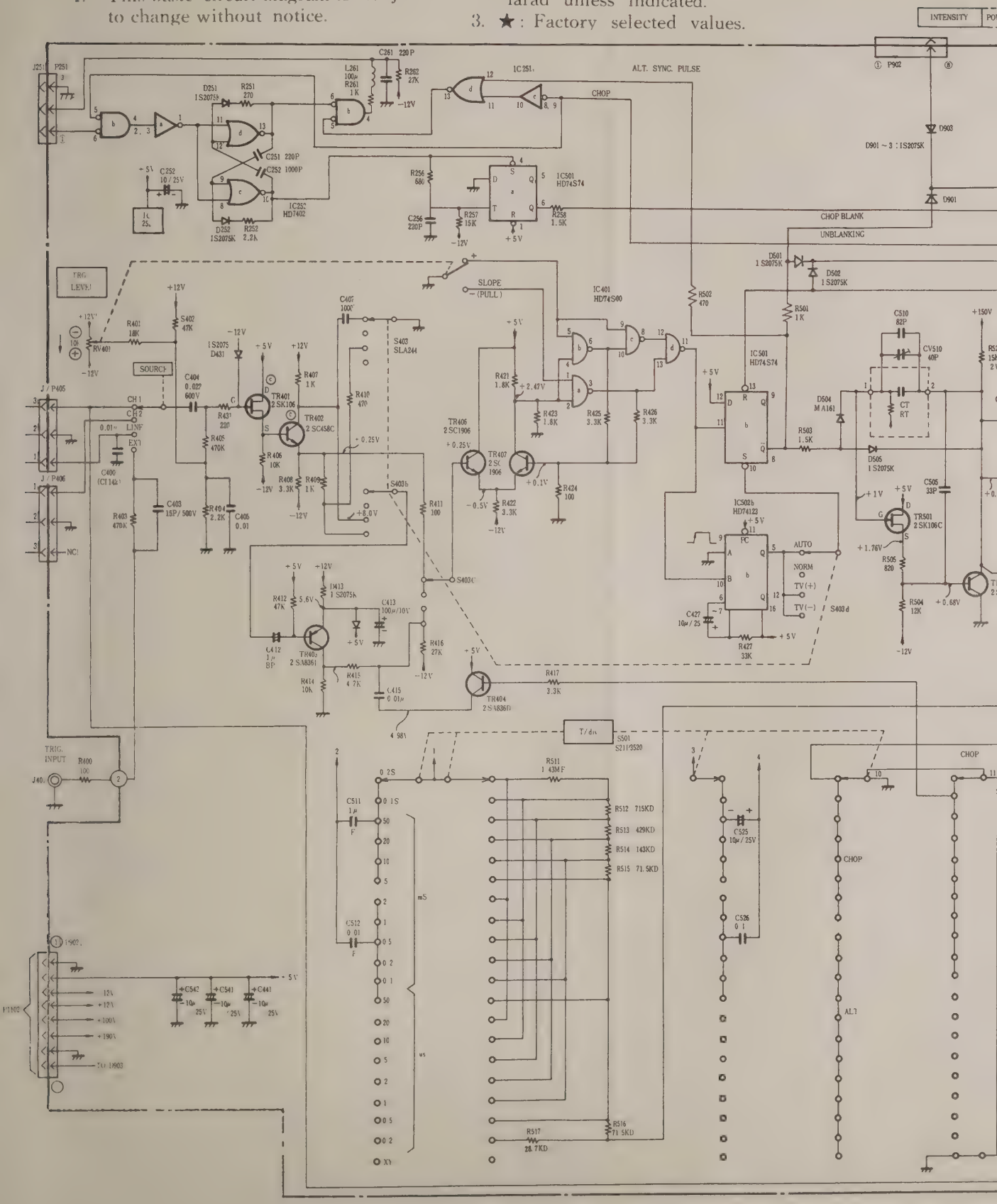
1. This basic circuit diagram is subject to change without notice.
2. All resister values in ohm: 1/4 W and all capacitor values in micro farad unless indicated.
3. ★: Factory selected values.

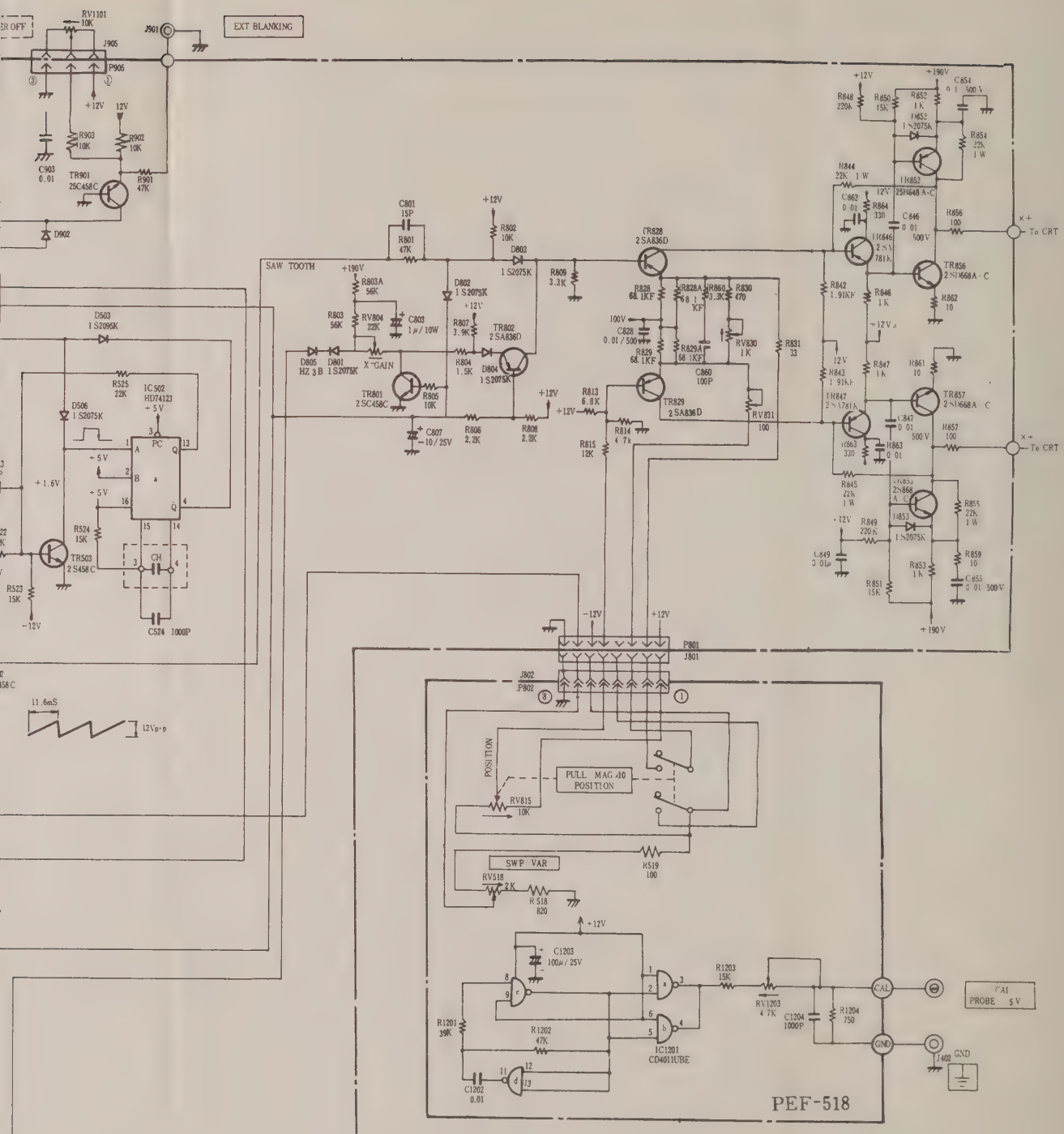
V—352 OSCILLOSCOPE SCHEMATIC DIAGRAM

〔VERTICAL DEFLECTION〕

Note

1. This basic circuit diagram is subject to change without notice.
2. All resister values in ohm: 1/4 W and all capacitor values in micro farad unless indicated.
3. ★: Factory selected values.





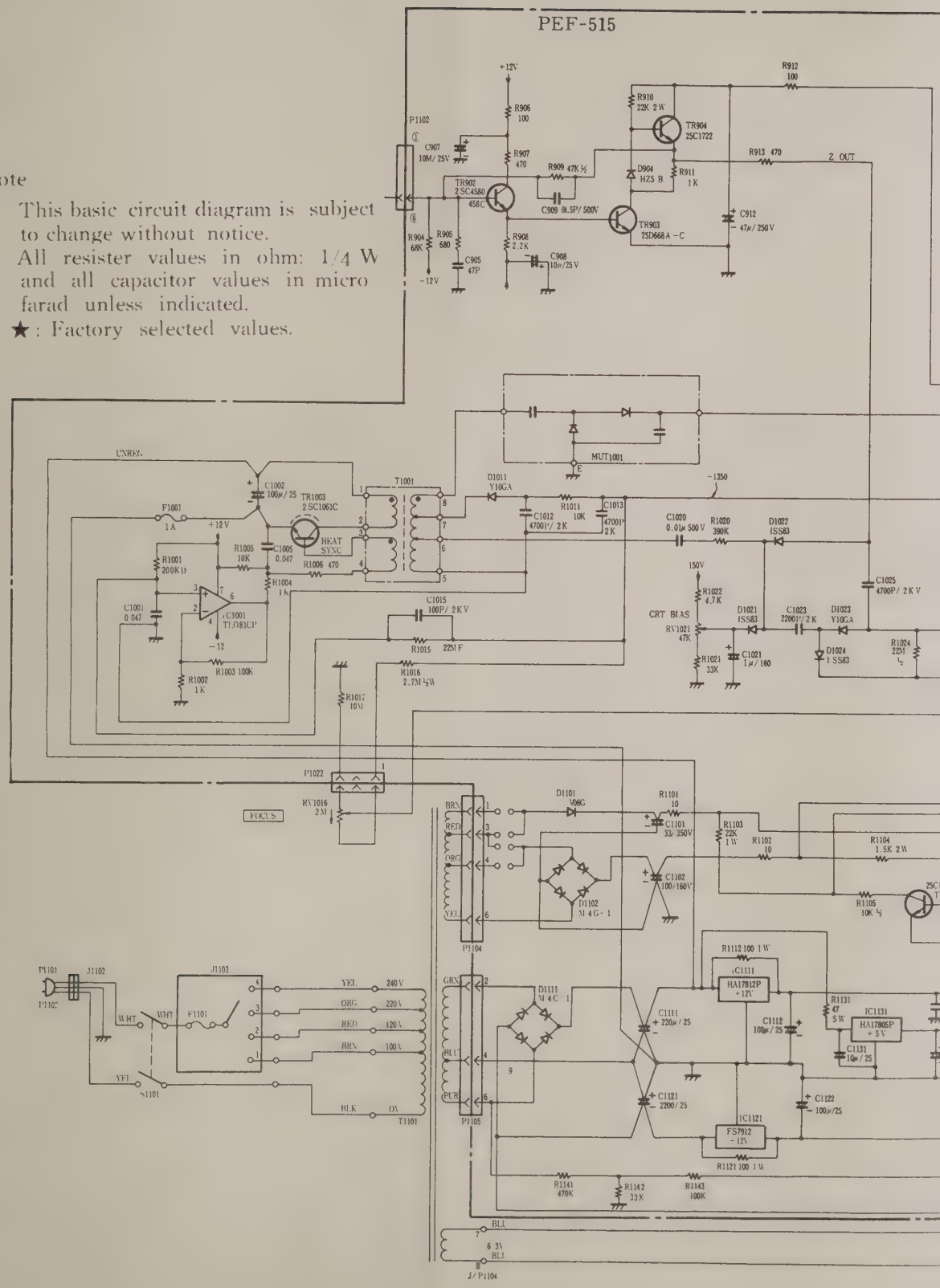
V—352
OSCILLOSCOPE
SCHEMATIC DIAGRAM

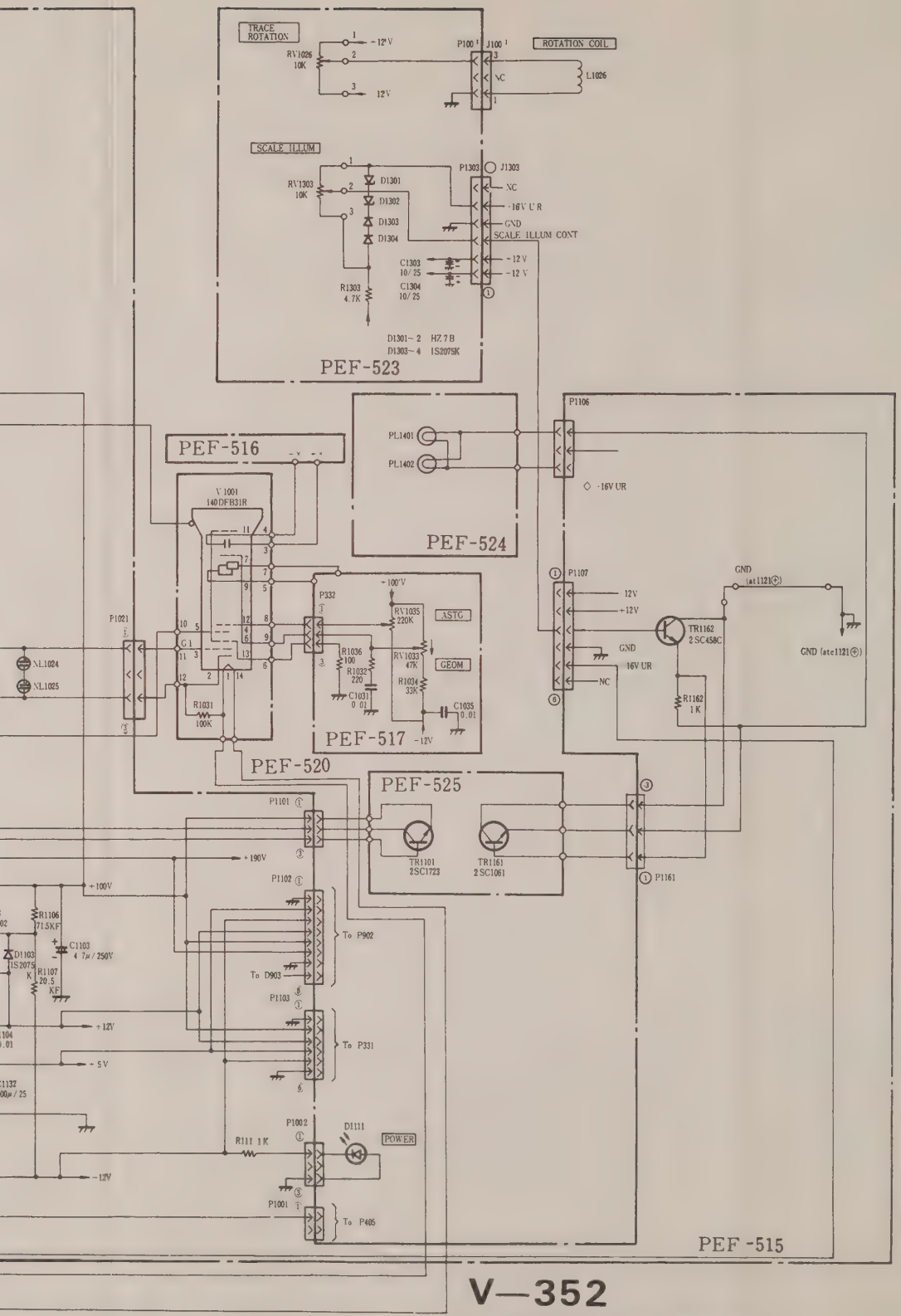
[HORIZONTAL DEFLECTION, TRIGGERING AND CAL]

PEF-515

Note

1. This basic circuit diagram is subject to change without notice.
2. All resister values in ohm: 1/4 W and all capacitor values in micro farad unless indicated.
3. ★: Factory selected values.





V—352
OSCILLOSCOPE
SCHEMATIC DIAGRAM

[POWER SUPPLY, HIGH VOLTAGE AND C.R.T CONTROLES]

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(PEF-515)

Symbol	Description	Code	Q'ty	
			V-202	V-352
C2	C,CERAMIC 500 V 5 PF+-0.5PF	CCC0769	1	1
C3	C,CERAMIC 500 V 5 PF+-0.5PF	CCC0769	1	1
CV4	C,VARIABLE ECV-1ZW10×93	HX 3142155	1	1
CV5	C,VARIABLE ECV-1ZW10×93	HX 3142155	1	1
C7	C,CERAMIC 50 V 68 PF+-5%	CCC1034	1	1
CV9	C,VARIABLE ECV-1ZW10×93	HX 3142155	1	1
C10	C,CERAMIC 500 V 3 PF+-0.5PF	CCC1404	1	1
CV10	C,VARIABLE ECV-1ZW10×93	HX 3142155	1	1
C12A	C,MICA 300 V 680 PF+-5%	CMD0359	1	1
C12B	C,CERAMIC 50 V 15 PF+-5%	CCC1004	1	1
C12C	C,CERAMIC 50 V 68 PF+-5%	CCC1034	1	1
C17	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1030	1	1
C18	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1030	1	1
C19	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1
C22	C,CERAMIC 500 V 1000 PF	CCC0590	1	1
C33	C,CERAMIC 50 V 5 PF+-0.25PF	CCC0999	1	1
C36	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C37	C,AL ELYC 25 V 47 UF	CEC0188	1	1
C38	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C39	C,CERAMIC 50 V 15 PF+-5%	CCC1004	1	
C39	C,CERAMIC 50 V 10 PF+-0.5PF	CCC1002		1
C51	C,PLASTIC 50 V 1000 PF+-10%	CQA0091	1	
C51	C,PLASTIC 50 V 4700 PF+-10%	CQA0101		1
CV52	C,VARIABLE ECV-1ZW 40×93	HX 3142155		1
C57	C,CERAMIC 50 V 33 PF+-5%	CCC1011	1	1
C58	C,CERAMIC 50 V 10 PF+-0.5PF	CCC1002		1
C58	C,CERAMIC 50 V 33 PF+-5%	CCC1011	1	
C65	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1
C66	C,CERAMIC 50 V 5 PF+-0.25PF	CCC0999	1	1
C102	C,CERAMIC 500 V 5 PF+-0.5PF	CCC0769	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
C103	C,CERAMIC 500 V 5 PF+-0.5PF	CCC0769	1	1
CV104	C,VARIABLE ECV-1ZW10 93	HX 3142155	1	1
CV105	C,VARIABLE ECV-1ZW10 93	HX 3142155	1	1
C107	C,CERAMIC 50 V 68 PF+-5%	CCC1034	1	1
CV109	C,VARIABLE ECV-1ZW10×93	HX 3142155	1	1
C110	C,CERAMIC 500 V 5 PF+-0.5PF	CCC0769	1	1
CV110	C,VARIABLE ECV-1ZW10×93	HX 3142155	1	1
C112A	C,MICA 300 V 680 PF+-5%	CMD0359	1	1
C117	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1030	1	1
C118	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1030	1	1
C119	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1
C122	C,CERAMIC 500 V 1000 PF	CCC0590	1	1
C133	C,CERAMIC 50V 6PF NPO	CCC1134	1	
C133	C,CERAMIC 50 V 8 PF+-0.5PF	CCC1001		1
C136	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C137	C,AL ELYC 25 V 47 UF	CEC0188	1	1
C138	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C139	C,CERAMIC 50 V 10 PF+-0.5PF	CCC1002		1
C139	C,CERAMIC 50 V 15 PF+-5%	CCC1004	1	
C151	C,PLASTIC 50 V 1000 PF+-10%	CQA0091	1	
C151	C,PLASTIC 50 V 47000 PF+-10%	CQA0101		1
CV152	C,VARIABLE ECV-1ZW40×93	HX 3142155	1	1
C157	C,CERAMIC 50 V 33 PF+-5%	CCC1011	1	1
C158	C,CERAMIC 50 V 33 PF+-5%	CCC1011	1	
C158	C,CERAMIC 50 V 10 PF+-0.5PF	CCC1002		1
C166	C,CERAMIC 50 V 5 PF+-0.25PF	CCC0999	1	1
C171	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1
C172	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1
C201	C,CERAMIC 50 V 15 PF+-5%	CCC1004	1	1
C202	C,AL ELYC 25 V 10 UF	CEC0175	1	1

Symbol	Description				Code	Q'ty	
						V-202	V-352
C204	C,AL ELYC	25 V	60	UF	CEC0175	1	1
C209	C,CERAMIC	50 V	1000	PF+80%-20%	CCC1029		1
C211	C,CERAMIC	50 V	15	PF+-5%	CCC1004	1	1
C219	C,CERAMIC	50 V	1000	PF+80%-20%	CCC1029		1
C309	C,CERAMIC	50 V	470	PF+-10%	CCC1162	1	
C309	C,CERAMIC	50 V	68	PF+-10%	CCC1034		1
C310	C,CERAMIC	50 V	15	PF+-5%	CCC1004		1
CV316	C,VARIABLE	ECV-1ZW20×93			HX 3142155	1	
C317	C,CERAMIC	50 V	22	PF+-5%	CCC1007		1
C905	C,CERAMIC	50 V	47	PF+-5%	CCC1014	1	1
C907	C,AL ELYC	25 V	10	UF	CEC0175	1	1
C909	C,CERAMIC	500 V	0.5	PF+-0.25PF	CCC1403	1	1
C908	C,AL ELYC	25 V	10	UF	CEC0175	1	1
C912	C,AL ELYC	250 V	4.7	UF	CEC0219	1	1
C1001	C,PLASTIC	50 V	0.1	UF+-10%	CQA0103	1	1
C1002	C,AL ELYC	25 V	100	UF	CEC0177	1	1
C1005	C,PLASTIC	50 V	47000	PF+-10%	CQA0101	1	1
C1012	C,CERAMIC	2000 V	4700	PF+-10%	CCD0221	1	1
C1013	C,CERAMIC	2000 V	4700	PF+-10%	CCD0221	1	1
C1015	C,CERAMIC	2000 V	100	PF+-10%	CCC1366	1	1
C1020	C,CERAMIC	500 V	10000	PF+-10%	CCD0218	1	1
C1021	C,AL ELYC	160 V	1	UF	CEC0213	1	1
C1023	C,CERAMIC	2000 V	2200	PF+-10%	CCD0219	1	1
C1025	C,CERAMIC	2000 V	4700	PF+-10%	CCD0221	1	1
C1101	C,AL ELYC	350 V	33	UF	CEC0395	1	1
C1102	C,AL ELYC	250 V	47	UF	CEC0484	1	
C1102	C,AL ELYC	160 V	100	UF	CEC0340		1
C1103	C,AL ELYC	250 V	4.7	UF	CEC0219	1	1
C1104	C,CERAMIC	50 V	10000	PF+80%-20%	CCC1030		1
C1111	C,AL ELYC	25 V	2200	UF	CEC0347	1	1
C1112	C,AL ELYC	25 V	100	UF	CEC0177	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
C1121	C,AL ELYC 25 V 2200 UF	CEC0347	1	1
C1122	C,AL ELYC 25 V 100 UF	CEC0177	1	1
C1131	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C1132	C,AL ELYC 25 V 100 UF	CEC0177	1	1
D201	DIODE 1S2075 T-D	HDS0108	1	1
D202	DIODE 1S2075 T-D	HDS0108	1	1
D203	DIODE 1S2075 T-D	HDS0108	1	1
D204	DIODE 1S2075 T-D	HDS0108	1	1
D211	DIODE 1S2075 T-D	HDS0108	1	1
D212	DIODE 1S2075 T-D	HDS0108	1	1
D213	DIODE 1S2075 T-D	HDS0108	1	1
D214	DIODE 1S2075 T-D	HDS0108	1	1
D904	DIODE HZ5B T-D	HDH0029	1	1
D1011	DIODE Y10GA	HDY0031	1	1
D1021	DIODE 1SS83	HDS0250	1	1
D1022	DIODE 1SS83	HDS0250	1	1
D1023	DIODE Y10GA	HDY0031	1	1
D1024	DIODE 1SS83	HDS0250	1	1
D1101	DIODE V06G	HDV0022	1	1
D1102	DIODE M4G-1	HDM0034	1	1
D1111	DIODE M4C-1	HDM0033	1	1
D1103	DIODE 1S2075 T-D	HDS0108	1	1
F1001	FUSE FR-11 125V DIA6.3×8.7 1A	EFL0016	1	1
IC1	IC,ANALOG TL071CP	ILT0041	1	1
IC101	IC,ANALOG TL071CP	TLT0041	1	1
IC201	IC HD74LS74AP	IDH0586	1	1
IC1001	IC,ANALOG TL081CP	ILT0037	1	1
IC1121	IC FS-7912	H 8338437	1	1
IC1111	IC HA17812P	H 8338426	1	1
IC1131	IC HA17805P	H 8338426	1	1

Symbol	Description		Code	Q'ty	
				V-202	V-352
MUT1001	MULTPLIER	3.8KV W/ANODE CAP	H 3142162		1
NL1024	LAMP	NE-2	ELL0019	1	1
NL1025	LAMP	NE-2	ELL0019	1	1
P2	CONNECTOR	171825-3	JBX0468	1	1
P102	CONNECTOR	171825-3	JBX0468	1	1
P201	CONNECTOR	171825-3	JBX0468	1	1
P202	CONNECTOR	171825-3	JBX0468	1	1
P203	CONNECTOR	171825-3	JBX0468	1	1
PEF-515	PCB	PB-4	H 116451	1	1
PEF-525	PCB	PB-4	H 116451		
P1002	CONNECTOR	171825-3	JBX0468	1	1
P1021	CONNECTOR	171825-3	JBX0468	1	1
P1022	CONNECTOR	171825-3	JBX0468	1	1
P1101	CONNECTOR	171825-3	JBX0468	1	1
P1102	CONNECTOR	171825-8	JBX0467	1	1
P1103	CONNECTOR	171825-6	JBX0470	1	1
P1104	CONNECTOR	171825-6	JBX0470	1	1
P1105	CONNECTOR	171825-6	JBX0470	1	1
P1106	CONNECTOR	171825-3	JBX0468	1	1
P1107	CONNECTOR	171825-6	JBX0470	1	1
P1161	CONNECTOR	171825-3	JBX0468	1	1
R3	R,CARBON	1/4W 100 OHM+-5%	RCR3028	1	1
R5A	R,CARBON	1/4W 330 OHM+-5%	RCR3040	1	1
R5	R,METAL	1/2W 900 KOHM+-0.5%	RME0812	1	1
R6	R,METAL	1/4W 111 KOHM+-0.5%	RME0694	1	1
R7	R,CARBON	1/4W 82 OHM+-5%	RCR3026	1	1
R9	R,CARBON	1/4W 470 OHM+-5%	RCR3044	1	1
R10	R,METAL	1/2W 990 KOHM+-0.5%	RME0813	1	1
R11	R,METAL	1/4W 10.1 KOHM+-0.5%	RME0695	1	1
R10A	R,CARBON	1/4W 120 OHM+-5%	RCR3030	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
R12	R,CARBON 1/4W 6.8 OHM+-5%	RCR3003	1	1
R12B	R,CARBON 1/4W 100 KOHM+-5%	RCR3100	1	1
R12C	R,CARBON 1/4W 2.2 MOHM+-5%	RCR3440	1	1
R17	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
R15	R,METAL 1/2W 800 KOHM+-0.5%	RME0814	1	1
R16	R,METAL 1/4W 200 KOHM+-0.5%	RME0702	1	1
R18	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R19	R,METAL 1/4W 12.1 KOHM+-1%	RME0677	1	1
RV19	VR,METAL CR29R 10 KOHM	H 8348450	1	1
R20	R,CARBON 1/4W 8.2 KOHM+-5%	RCR3074	1	1
R21	R,METAL 1/4W 4.00 KOHM+-0.5%	RME0707	1	1
R22	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R23	R,SOLID 1/2W 10 MOHM+-5%	RSE0311	1	1
R24	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	1
R25	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R26	R,CARBON 1/4W 1.8 KOHM+-5%	RCR3058	1	1
R26A	R,CARBON 1/4W 8.2 KOHM+-5%	RCR3074	1	1
R27	R,METAL 1/4W 200 KOHM+-0.5%	RME0702	1	1
R28	R,METAL 1/4W 46.0 KOHM+-0.5%	RME0706	1	1
R29	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	1
R30	R,METAL 1/4W 47.5 OHM+-1%	RME0648	1	1
R31	R,METAL 1/4W 412 OHM+-1%	RME0733	1	1
R32	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
RV32	VR,METAL CR29R 4.7 KOHM	H 8348450	1	1
R33	R,METAL 1/4W 475 OHM+-1%	RME0660	1	1
R34	R,CARBON 1/4W 820 OHM+-5%	RCR3050	1	1
R35	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1
R36	R,CARBON 1/4W 10 OHM+-5%	RCR3004	1	1
R38	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	1
R39	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
R40	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
RV40	VR,CARBON V16L4-N20KC B 1KOHM	HX 3142131	1	1
R41	R,METAL 1/4W 300 OHM+-0.5%	RME0708	1	1
R42	R,METAL 1/4W 150 OHM+-0.5%	RME0709	1	1
R43	R,METAL 1/4W 90.0 OHM+-0.5%	RME0710	1	1
R44	R,METAL 1/4W 60.0 OHM+-0.5%	RME0711	1	1
R45	R,CARBON 1/4W 150 OHM+-5%	RCR3032	1	1
R46	R,CARBON 1/4W 39 OHM+-5%	RCR3018	1	1
R47	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R48	R,CARBON 1/4W 220 OHM+-5%	RCR3036		1
R48	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	
R50	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1
R51	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	
R51	R,CARBON 1/4W 10 KOHM+-5%	RCR3076		1
R52	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1
R53	R,CARBON 1/4W 68 OHM+-5%	RCR3024		1
R53	R,CARBON 1/4W 33 OHM+-5%	RCR3016	1	
RV53	VR,METAL CR29R 100 OHM	H 8348450	1	1
R54	R,CARBON 1/4W 2.7 KOHM+-5%	RCR3062	1	1
RV54	VR,METAL CR29R 2.2 KOHM	H 8348450	1	1
R55	R,CARBON 1/4W 2.7 KOHM+-5%	RCR3062	1	1
R57	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1
R58	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1
R59	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R60	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R61	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
RV61	VR,CARBON EVH-Y13K20B13	RDE0013	1	1
		HX 8311701	R	R
		HX 8311701	R	R
R62	R,METAL 1/4W 1.15 KOHM+-1%	RME0727	1	1
R63	R,METAL 1/4W 1.15 KOHM+-1%	RME0727	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
R64	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
R65	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
R66	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1
R103	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	1
R105	R,METAL 1/2W 900 KOHM+-0.5%	RME0812	1	1
R105A	R,CARBON 1/4W 390 OHM+-5%	RCR3042	1	1
R106	R,METAL 1/4W 111 KOHM+-0.5%	RME0694	1	1
R107	R,METAL 1/4W 110 OHM+-1%	RMR0460	1	1
R109	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	1
R110	R,METAL 1/2W 990 KOHM+-0.5%	RME0813	1	1
R111	R,METAL 1/4W 10.1 KOHM+-0.5%	RME0695	1	1
R110A	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R112B	R,CARBON 1/4W 100 KOHM+-5%	RCR3100	1	1
R115	R,METAL 1/2W 800 KOHM+-0.5%	RME0814	1	1
R116	R,METAL 1/4W 200 KOHM+-0.5%	RME0702	1	1
R117	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
R118	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R119	R,METAL 1/4W 12.1 KOHM+-1%	RME0677	1	1
RV119	VR,METAL CR29R 10 KOHM	H 8348450	1	1
R120	R,CARBON 1/4W 8.2 KOHM+-5%	RCR3074	1	1
R121	R,METAL 1/4W 4.00 KOHM+-0.5%	RME0707	1	1
R122	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R123	R,SOLID 1/2W 10 MOHM+-5%	RSE0311	1	1
R124	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	1
R125	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R126	R,CARBON 1/4W 1.8 KOHM+-5%	RCR3058	1	1
R126A	R,CARBON 1/4W 8.2 KOHM+-5%	RCR3074	1	1
R127	R,METAL 1/4W 200 KOHM+-0.5%	RME0702	1	1
R128	R,METAL 1/4W 46.0 KOHM+-0.5%	RME0706	1	1
R129	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
R130	R,METAL 1/4W 47.5 OHM+-1%	RME0648	1	1
R131	R,METAL 1/4W 412 OHM+-1%	RME0733	1	1
R132	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
R133	R,METAL 1/4W 475 OHM+-1%	RME0660	1	1
RV132	VR.METAL CR29R 4.7 KOHM	H 8348450	1	1
R134	R,CARBON 1/4W 820 OHM+-5%	RCR3050	1	1
R135	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1
R136	R,CARBON 1/4W 10 OHM+-5%	RCR3004	1	1
R138	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	1
R139	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1
R140	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
RV140	VR,CARBON V16L4-N20KC B 1KOHM	HX 3142131	1	1
R141	R,METAL 1/4W 300 OHM+-0.5%	RME0708	1	1
R142	R,METAL 1/4W 150 OHM+-0.5%	RME0709	1	1
R143	R,METAL 1/4W 90.0 OHM+-0.5%	RME0710	1	1
R144	R,METAL 1/4W 60.0 OHM+-0.5%	RME0711	1	1
R145	R,CARBON 1/4W 150 OHM+-5%	RCR3032	1	1
R146	R,CARBON 1/4W 39 OHM+-5%	RCR3018	1	1
R147	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R148	R,CARBON 1/4W 220 OHM+-5%	RCR3036		1
R148	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	
R150	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1
R151	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	
R151	R,CARBON 1/4W 10 KOHM+-5%	RCR3076		1
R152	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1
R152	R,CARBON 1/4W 150 OHM+-5%	RCR3032	1	
R153	R,CARBON 1/4W 68 OHM+-5%	RCR3024		1
R153	R,CARBON 1/4W 33 OHM+-5%	RCR3016	1	
RV153	VR,METAL CR29R 100 OHM	H 8348450	1	1
R154	R,CARBON 1/4W 2.7 KOHM+-5%	RCR3062	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
RV154	VR,METAL CR29R 2.2 KOHM	H 8348450	1	1
R155	R,CARBON 1/4W 2.7 KOHM+-5%	RCR3062	1	1
R157	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1
R158	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1
R159	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R160	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R161	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
RV161	VR,CARBON EVH-Y13K20B13	RDE0013	1	1
		HX 8311705	R	R
		HX 8311701	R	R
R162	R,METAL 1/4W 1.15 KOHM+-1%	RME0727	1	1
R163	R,METAL 1/4W 1.15 KOHM+-1%	RME0727	1	1
R166	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1
R171	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
R172	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
R173	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
R174	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
R201	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1
R202	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061	1	1
R203	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061	1	1
R204	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061		1
R204	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	
R205	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1
R206	R,CARBON 1/4W 680 OHM+-5%	RCR3048	1	1
R207	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1
R208	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R209	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	1
R211	R,CARBON 1/4W 330 OHM+-5%	RCR3040	1	1
R212	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061	1	1
R213	R,CARBON 1/4W 2.4 KOHM+-5%	RCR3061	1	1

Symbol	Description				Code	Q'ty	
						V-202	V-352
R214	R,CARBON	1/4W	2.2	KOHM+-5%	RCR3060	1	
R214	R,CARBON	1/4W	2.4	KOHM+-5%	RCR3061		1
R215	R,CARBON	1/4W	1.0	KOHM+-5%	RCR3052	1	1
R216	R,CARBON	1/4W	680	OHM+-5%	RCR3048	1	1
R217	R,CARBON	1/4W	47	OHM+-5%	RCR3020	1	1
R218	R,CARBON	1/4W	100	OHM+-5%	RCR3028	1	1
R219	R,CARBON	1/4W	220	OHM+-5%	RCR3036	1	1
R221	R,CARBON	1/4W	150	OHM+-5%	RCR3032	1	1
R222	R,CARBON	1/4W	150	OHM+-5%	RCR3032	1	1
R223	R,CARBON	1/4W	150	OHM+-5%	RCR3032	1	1
R224	R,CARBON	1/4W	150	OHM+-5%	RCR3032	1	1
R231	R,CARBON	1/4W	270	OHM+-5%	RCR3038		1
R233	R,CARBON	1/4W	270	OHM+-5%	RCR3038		1
R265	R,CARBON	1/4W	470	OHM+-5%	RCR3044	1	1
R301	R,CARBON	1/4W	330	OHM+-5%	RCR3040	1	1
R302	R,CARBON	1/4W	470	OHM+-5%	RCR3044	1	1
R303	R,CARBON	1/4W	3.3	KOHM+-5%	RCR3064	1	1
R304	R,CARBON	1/4W	3.3	KOHM+-5%	RCR3064	1	1
R305	R,CARBON	1/4W	2.2	KOHM+-5%	RCR3060	1	1
R306	R,CARBON	1/4W	2.2	KOHM+-5%	RCR3060	1	1
R307	R,CARBON	1/4W	330	OHM+-5%	RCR3040	1	1
R308	R,CARBON	1/4W	470	OHM+-5%	RCR3044	1	1
R309	R,CARBON	1/4W	47	KOHM+-5%	RCR3092	1	1
R310	R,CARBON	1/4W	6.8	KOHM+-5%	RCR3072		1
R311	R,CARBON	1/4W	1.5	KOHM+-5%	RCR3056	1	1
R312	R,CARBON	1/4W	1.5	KOHM+-5%	RCR3056	1	1
R313	R,CARBON	1/4W	91	OHM+-5%	RCR3027	1	
R313	R,METAL	1/4W	86.6	OHM+-1%	RME0796		1
R314	R,METAL	1/4W	86.6	OHM+-1%	RME0796		1
R314	R,CARBON	1/4W	91	OHM+-5%	RCR3027	1	

Symbol	Description	Code	Q'ty	
			V-202	V-352
R315	R,CARBON 1/2W 560 OHM+-5%	RCR3153	1	1
R316	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	
R316	R,CARBON 1/4W 6.8 KOHM+-5%	RCR3072		1
R317	R,CARBON 1/4W 220 OHM+-5%	RCR3036		1
R904	R,CARBON 1/4W 68 KOHM+-5%	RCR3096	1	1
R905	R,CARBON 1/4W 680 OHM+-5%	RCR3048	1	1
R906	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R907	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
R908	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
R909	R,CARBON 1/2W 47 KOHM+-5%	RCR3199	1	1
R910	R,METAL 2 W 22 KOHM+-5%	RMR2807	1	
R910	R,METAL 2 W 10 KOHM+-5%	RMR2805		1
R911	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	
R911	R,CARBON 1/4W 820 OHM+-5%	RCR3050		1
R912	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R913	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
R1001	R,METAL 1/4W 137 KOHM+-1%	RME0818	1	
R1001	R,METAL 1/4W 200 KOHM+-0.5%	RME0702		1
R1002	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1
R1003	R,CARBON 1/4W 100 KOHM+-5%	RCR3100	1	1
R1004	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1
R1005	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1
R1006	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	
R1006	R,CARBON 1/4W 470 OHM+-5%	RCR3044		1
R1011	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1
R1015	R,METAL 1 W 22 MOHM+-1%	HX 3142076	1	1
R1016	R,CARBON 1/2W 1.8 MOHM+-5%	RCR3476	1	
R1016	R,CARBON 1/2W 2.7 MOHM+-5%	RCR3480		1
R1017	R,METAL 1 W 12 MOHM+-5%	HX 3142076	1	
R1017	R,METAL 1 W 10 MOHM+-5%	HX 3142076		1

Symbol	Description				Code	Q'ty	
						V-202	V-352
R1020	R,CARBON	1/4W	390	KOHM+-5%	RCR3426	1	1
R1021	R,CARBON	1/4W	33	KOHM+-5%	RCR3088		1
RV1021	VR,METAL	CR29R	47	KOHM	H 8348450	1	1
R1021	R,CARBON	1/4W	22	KOHM+-5%	RCR3084	1	
R1022	R,CARBON	1/4W	4.7	KOHM+-5%	RCR3068		1
R1022	R,CARBON	1/4W	15	KOHM+-5%	RCR3080	1	
R1024	R,SOLID	1/2W	22	MOHM+-5%	RSR0420	1	1
R1103	R,METAL	1 W	33	KOHM+-5%	RMR2785	1	
R1104	R,METAL	2 W	3.3	KOHM+-5%	RMR2802	1	
R1104	R,METAL	2 W	1.5	KOHM+-5%	RMR2800		1
R1105	R,CARBON	1/2W	10	KOHM+-5%	RCR3183		1
R1105	R,CARBON	1/2W	22	KOHM+-5%	RCR3191	1	
R1106	R,METAL	1/4W	113	KOHM+-1%	RME0740	1	
R1107	R,METAL	1/4W	20.5	KOHM+-1%	RME0724	1	1
R1102	R,CARBON	1/4W	10	OHM+-5%	RCR3004	1	1
R1103	R,METAL	1 W	22	KOHM+-5%	RMR2784		1
R1106	R,METAL	1/4W	71.5	KOHM+-1%	RME0734		1
R1111	R,CARBON	1/4W	1.0	KOHM+-5%	RCR3052	1	1
R1131	R,METAL	5 W	47	OHM+-5%	RMR2837	1	1
R1141	R,CARBON	1/4W	470	KOHM+-5%	RCR3104	1	1
R1142	R,CARBON	1/4W	33	KOHM+-5%	RCR3088	1	1
R1143	R,CARBON	1/4W	100	KOHM+-5%	RCR3100	1	1
R1101	R,CARBON	1/4W	10	OHM+-5%	RCR3004	1	1
R1112	R,METAL	1	100	OHM+-5%	RMR2770		1
R1121	R,METAL	1	100	OHM+-5%	RMR2770	1	1
R1162	R,CARBON	1/4W	1.0	KOHM+-5%	RCR3052	1	1
S2	SW,ROTARY	S21P2310			H 8338423	1	1
S102	SW,ROTARY	S21P2310			H 8338423	1	1
S201	SW,LEVER	SLA245			SSL0053	1	1
TR1	TRANSISTOR	2SK106C			HTK0068	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
TR2	TRANSISTOR 2SA1029 D	HTA0224	1	1
TR3	TRANSISTOR 2SC1906	HTC0338	1	1
TR6	TRANSISTOR 2SC1906	HTC0338	1	1
TR7	TRANSISTOR 2SC1906	HTC0338	1	1
TR8	TRANSISTOR 2SA836D	HTA0105	1	1
TR9	TRANSISTOR 2SA836D	HTA0105	1	1
TR101	TRANSISTOR 2SK106C	HTK0068	1	1
TR102	TRANSISTOR 2SA1029 D	HTA0224	1	1
TR103	TRANSISTOR 2SC1906	HTC0338	1	1
TR106	TRANSISTOR 2SC1906	HTC0338	1	1
TR107	TRANSISTOR 2SC1906	HTC0338	1	1
TR111	TRANSISTOR 2SA836D	HTA0105	1	1
TR112	TRANSISTOR 2SA836D	HTA0105	1	1
TR113	TRANSISTOR 2SA836D	HTA0105	1	1
TR114	TRANSISTOR 2SA836D	HTA0105	1	1
TR201	TRANSISTOR 2SA781K	HTA0099		1
TR201	TRANSISTOR 2SA836D	HTA0105	1	
TR202	TRANSISTOR 2SA836D	HTA0105	1	
TR202	TRANSISTOR 2SA781K	HTA0099		1
TR203	TRANSISTOR 2SC458C	HTC0148	1	
TR203	TRANSISTOR 2SC1906	HTC0338		1
TR211	TRANSISTOR 2SA781K	HTA0099		1
TR211	TRANSISTOR 2SA836D	HTA0105	1	
TR212	TRANSISTOR 2SA836D	HTA0105	1	
TR212	TRANSISTOR 2SA781K	HTA0099		1
TR213	TRANSISTOR 2SC458C	HTC0148	1	
TR213	TRANSISTOR 2SC1906	HTC0338		1
TR301	TRANSISTOR 2SC1906	HTC0338	1	1
TR302	TRANSISTOR 2SC1906	HTC0338	1	1
TR902	TRANSISTOR 2SC458C	HTC0148	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
TR903	TRANSISTOR 2SD668A-C	HTD0100	1	1
TR904	TRANSISTOR 2SC1722	HTC0514	1	1
T1001	XFMR D#3142165	H 3142165	1	1
TR1003	TRANSISTOR 2SC1061C	HTC0032	1	1
TR1101	TRANSISTOR 2SC1723	HTC0492	1	1
TR1102	TRANSISTOR 2SC1723	HTC0492	1	1
TR1161	TRANSISTOR 2SC1061C	HTC0032	1	1
TR1162	TRANSISTOR 2SC458C	HTC0148	1	1

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(PEF-516)

Symbol	Description	Code	Q'ty	
			V-202	V-352
C251	C,CERAMIC 50 V 220 PF+-10%	CCC1027	1	1
C252	C,PLASTIC 50 V 1000 PF+-10%	CQA0091	1	1
C253	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C256	C,CERAMIC 50 V 220 PF+-10%	CCC1027	1	1
C261	C,CERAMIC 50 V 470 PF+-10%	CCC1162	1	
C261	C,CERAMIC 50 V 220 PF+-10%	CCC1027		1
C403	C,CERAMIC 500 V 15 PF+-10%	CCC0774	1	1
C404	C,PLASTIC 600 V 22000 PF+-10%	CQX0071	1	1
C405	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1030	1	1
C400	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1030	1	1
C407	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1
C412	C,AL ELYC 50 V 1 UP NP	CEC0391	1	1
C413	C,AL ELYC 10 V 100 UF	CES0029	1	1
C415	C,PLASTIC 50 V 10000 PF+-10%	CQA0097	1	1
C427	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C441	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C505	C,CERAMIC 50 V 33 PF+-5%	CCC1011	1	1
C510	C,CERAMIC 50 V 82 PF+-5%	CCC1032	1	1
C511,512	C,PLASTIC 100 V 1UF+0.01UF	HX 3142077	1	1
CV510	C,VARIABLE ECV-1ZW40×93 U	HX 3142155	1	1
C513	C,CERAMIC 50 V 22 PF+-5%	CCC1007	1	1
C524	C,PLASTIC 50 V 1000 PF+-10%	CQA0091	1	1
C525	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C526	C,PLASTIC 50 V 0.1 UF+-10%	CQA0103	1	1
C541	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C542	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C801	C,CERAMIC 50 V 33 PF+-5%	CCC1011	1	
C801	C,CERAMIC 50 V 15 PF+-5%	CCC1004		1
C803	C,AL ELYC 160 V 1 UF	CEC0213	1	1
C807	C,AL ELYC 25 V 10 UF	CEC0175	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
C828	C,CERAMIC 500 V 10000 PF	CCC0591	1	1
C832	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	
C844	C,CERAMIC 500 V 1 PF+-0.25PF	CCC1353	1	
C845	C,CERAMIC 500 V 1 PF+-0.25PF	CCC1353	1	
C846	C,CERAMIC 500 V 10000 PF+-10%	CCD0218		1
C847	C,CERAMIC 500 V 10000 PF+-10%	CCD0218		1
C849	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1030		1
C854	C,CERAMIC 500 V 10000 PF+-10%	CCD0218	1	1
C855	C,CERAMIC 500 V 10000 PF+-10%	CCD0218	1	1
C862	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1030		1
C863	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1030		1
C860	C,CERAMIC 50 V 47 PF+-5%	CCC1014	1	
C860	C,CERAMIC 50 V 100 PF+-10%	CCC1025		1
C903	C,CERAMIC 50 V 10000 PF+80%-20%	CCC1030	1	1
D251	DIODE 1S2075 T-D	HDS0108	1	1
D252	DIODE 1S2075 T-D	HDS0108	1	1
D413	DIODE 1S2075 T-D	HDS0108	1	1
D431	DIODE 1S2075 T-D	HDS0108	1	1
D501	DIODE 1S2075 T-D	HDS0108	1	1
D502	DIODE 1S2075 T-D	HDS0108	1	1
D503	DIODE 1S2075 T-D	HDS0108	1	1
D505	DIODE 1S2075 T-D	HDS0108	1	1
D504	DIODE MA161	HDM0051	1	1
D506	DIODE 1S2075 T-D	HDS0108	1	1
D801	DIODE 1S2075 T-D	HDS0108	1	1
D802	DIODE 1S2075 T-D	HDS0108	1	1
D803	DIODE 1S2075 T-D	HDS0108	1	1
D804	DIODE 1S2075 T-D	HDS0108		1
D805	DIODE HZ3B T-D	HDH0024		1
D852	DIODE 1S2075 T-D	HDS0108		1

Symbol	Description	Code	Q'ty	
			V-202	V352
D853	DIODE 1S2075 T-D	HDS0108		1
D901	DIODE 1S2075 T-D	HDS0108	1	1
D902	DIODE 1S2075 T-D	HDS0108	1	1
D903	DIODE 1S2075 T-D	HDS0108	1	1
IC251	DIGITAL IC HD74LS02P	IDH0646	1	1
IC252	DIGITAL IC HD7402P	IDH0179	1	1
IC401	DIGITAL IC HD7400P	IDH0177	1	
IC401	DIGITAL IC HD74S00	IDH0402		1
IC501	IC HD74LS74AP	IDH0586	1	
IC501	DIGITAL IC HD74S74	IDH0428		1
IC502	DIGITAL IC HD74123P	IDH0323	1	1
L261	COIL FL-7H 101K	TLF0004	1	1
L854	COIL FL-7H 682J	TLF0148	1	
P251	CONNECTOR 171825-3	JBX0468	1	1
P405	CONNECTOR 171825-3	JBX0468	1	1
P406	CONNECTOR 171825-3	JBX0468	1	1
PEF-516	PCB PB-5	H 116452	1	1
		H 291481	R	R
P801	CONNECTOR 171825-8	JBX0467	1	1
P905	CONNECTOR 171825-3	JBX0468	1	1
P902	CONNECTOR 171825-8	JBX0467	1	1
R251	R,CARBON 1/4W 270 OHM+-5%	RCR3038	1	1
R252	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
R256	R,CARBON 1/4W 680 OHM+-5%	RCR3048	1	1
R257	R,CARBON 1/4W 27 KOHM+-5%	RCR3086	1	
R257	R,CARBON 1/4W 15 KOHM+-5%	RCR3080		1
R258	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056	1	1
R261	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1
R262	R,CARBON 1/4W 27 KOHM+-5%	RCR3086	1	1
R401	R,CARBON 1/4W 18 KOHM+-5%	RCR3082	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
R402	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1
R403	R,CARBON 1/4W 470 KOHM+-5%	RCR3104	1	1
R404	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
R405	R,CARBON 1/4W 470 KOHM+-5%	RCR3104	1	1
R406	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1
R407	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1
R408	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1
R409	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1
R410	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
R411	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R412	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1
R413	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1
R414	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1
R415	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	1
R416	R,CARBON 1/4W 27 KOHM+-5%	RCR3086	1	1
R417	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1
R421	R,CARBON 1/4W 1.8 KOHM+-5%	RCR3058	1	1
R422	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1
R423	R,CARBON 1/4W 1.8 KOHM+-5%	RCR3058	1	1
R424	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
R425	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1
R426	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	1
R427	R,CARBON 1/4W 33 KOHM+-5%	RCR3088	1	1
R431	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	1
RV401	VR,CARBON EVH-Y13K20B14	RDE0003	1	1
		HX 8311705	R	R
		HX 8311701	R	R
R501	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052	1	1
R502	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	1
R503	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
R504	R,CARBON 1/4W 12 KOHM+-5%	RCR3078	1	1
R505	R,CARBON 1/4W 820 OHM+-5%	RCR3050	1	1
R511	R,METAL 1/2W 1.43 MOHM+-1%	RMR3282	1	1
R512	R,METAL 1/8W 715 KOHM+-0.5%	RMR2262	1	1
R513	R,METAL 1/4W 429 KOHM+-0.5%	RME0699	1	1
R514	R,METAL 1/4W 143 KOHM+-0.5%	RME0718	1	1
R515	R,METAL 1/4W 71.5 KOHM+-0.5%	RME0717	1	1
R516	R,METAL 1/4W 71.5 KOHM+-0.5%	RME0717	1	1
R517	R,METAL 1/4W 28.7 KOHM+-0.5%	RME0815	1	1
R521	R,METAL 2 W 22 KOHM+-5%	RMR2807	1	
R521	R,METAL 2 W 15 KOHM+-5%	RMR2806		1
R522	R,CARBON 1/4W 12 KOHM+-5%	RCR3078	1	1
R523	R,CARBON 1/4W 15 KOHM+-5%	RCR3080	1	1
R524	R,CARBON 1/4W 15 KOHM+-5%	RCR3080	1	1
R525	R,CARBON 1/4W 22 KOHM+-5%	RCR3084	1	1
R801	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	1
R802	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1
R803A	R,CARBON 1/4W 56 KOHM+-5%	RCR3094		1
R803	R,CARBON 1/4W 56 KOHM+-5%	RCR3094	1	1
R803A	R,CARBON 1/4W 180 KOHM+-5%	RCR3420	1	
R804	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056	1	1
RV804	VR,METAL CR29R 2.2 KOHM	H 8348450	1	1
R805	R,CARBON 1/4W 10 KOHM+-5%	RCR3076		1
R805	R,CARBON 1/4W 6.8 KOHM+-5%	RCR3072	1	
R806	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060		1
R806	R,CARBON 1/4W 3.9 KOHM+-5%	RCR3066	1	
R807	R,CARBON 1/4W 3.9 KOHM+-5%	RCR3066		1
R807	R,METAL 1/4W 5.11 KOHM+-1%	RME0701	1	
R808	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060		1
R808	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	

Symbol	Description	Code	Q'ty	
			V-202	V-352
R809	R,CARBON 1/4W 1.5 KOHM+-5%	RCR3056	1	
R809	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064		1
R813	R,CARBON 1/4W 8.2 KOHM+-5%	RCR3074		1
R813	R,CARBON 1/4W 8.2 KOHM+-5%	RCR3074	1	
R814	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	
R814	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068		1
R815	R,CARBON 1/4W 12 KOHM+-5%	RCR3078	1	1
R828	R,METAL 1/4W 158 KOHM+-1%	RME0731	1	
R828	R,METAL 1/4W 68.1 KOHM+-1%	RME0686		1
R829	R,METAL 1/4W 158 KOHM+-1%	RME0731	1	
R829	R,METAL 1/4W 68.1 KOHM+-1%	RME0686		1
R828A	R,METAL 1/4W 68.1 KOHM+-1%	RME0686		1
R829A	R,METAL 1/4W 68.1 KOHM+-1%	RME0686		1
R830	R,CARBON 1/4W 1.2 KOHM+-5%	RCR3054	1	
R830	R,CARBON 1/4W 470 OHM+-5%	RCR3044		1
RV830	VR,METAL CR29R 1 KOHM	H 8348450	1	1
R831	R,CARBON 1/4W 68 OHM+-5%	RCR3024	1	
R831	R,CARBON 1/4W 33 OHM+-5%	RCR3016		1
RV831	VR,METAL CR29R 220 OHM	H 8348450	1	
RV831	VR,METAL CR29R 100 OHM	H 8348450		1
R832	R,CARBON 1/4W 470 OHM+-5%	RCR3044	1	
R842	R,METAL 1/4W 6.19 KOHM+-1%	RME0729	1	
R843	R,METAL 1/4W 6.19 KOHM+-1%	RME0729	1	
R842	R,METAL 1/4W 1.91 KOHM+-1%	RME0819		1
R843	R,METAL 1/4W 1.91 KOHM+-1%	RME0819		1
R844	R,METAL 1 W 22 KOHM+-5%	RMR2784		1
R844	R,CARBON 1/2W 100 KOHM+-5%	RCR3207	1	
R845	R,CARBON 1/2W 100 KOHM+-5%	RCR3207	1	
R845	R,METAL 1 W 22 KOHM+-5%	RMR2784		1
R846	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052		1

Symbol	Description	Code	Q'ty	
			V-202	V-352
R846	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	
R847	R,CARBON 1/4W 3.3 KOHM+-5%	RCR3064	1	
R847	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052		1
R848	R,CARBON 1/4W 220 KOHM+-5%	RCR3102		1
R849	R,CARBON 1/4W 220 KOHM+-5%	RCR3102		1
R850	R,CARBON 1/4W 15 KOHM+-5%	RCR3080		1
R851	R,CARBON 1/4W 15 KOHM+-5%	RCR3080		1
R852	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052		1
R853	R,CARBON 1/4W 1.0 KOHM+-5%	RCR3052		1
R854	R,METAL 5 W 22 KOHM+-5%	RMR2853	1	
R854	R,METAL 1 W 22 KOHM+-5%	RMR2784		1
R855	R,METAL 1 W 22 KOHM+-5%	RMR2784		1
R855	R,METAL 5 W 22 KOHM+-5%	RMR2853	1	
R856	R,CARBON 1/4W 100 OHM+-5%	RCR3028		1
R856	R,CARBON 1/4W 270 OHM+-5%	RCR3038	1	
R857	R,CARBON 1/4W 270 OHM+-5%	RCR3038	1	
R857	R,CARBON 1/4W 100 OHM+-5%	RCR3028		1
R859	R,CARBON 1/4W 10 OHM+-5%	RCR3004	1	1
R860	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	
R860	R,CARBON 1/4W 33 KOHM+-5%	RCR3088		1
R861	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1
R862	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1
R863	R,CARBON 1/4W 330 OHM+-5%	RCR3040		1
R864	R,CARBON 1/4W 330 OHM+-5%	RCR3040		1
R901	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1
R902	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1
R903	R,CARBON 1/4W 10 KOHM+-5%	RCR3076	1	1
S402	SW,LEVER SLA224 NON SHORT	SSL0054	1	1
S403	SW,LEVER SLA244 NON SHORT	SSL0055	1	1
S501	SW,ROTARY S21P3520	HX 8311684	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
		HX 8311686	R	R
TR401	TRANSISTOR 2SK106C	HTK0068	1	1
TR402	TRANSISTOR 2SC458C	HTC0148	1	1
TR403	TRANSISTOR 2SA836D	HTA0105	1	1
TR404	TRANSISTOR 2SA836D	HTA0105	1	1
TR406	TRANSISTOR 2SC1906	HTC0338	1	1
TR407	TRANSISTOR 2SC1906	HTC0338	1	1
TR501	TRANSISTOR 2SK106C	HTK0068	1	1
TR502	TRANSISTOR 2SC458C	HTC0148	1	1
TR503	TRANSISTOR 2SC458C	HTC0148	1	1
TR801	TRANSISTOR 2SC458C	HTC0148	1	1
TR802	TRANSISTOR 2SA836D	HTA0105	1	1
TR828	TRANSISTOR 2SA836D	HTA0105	1	1
TR829	TRANSISTOR 2SA836D	HTA0105	1	1
TR846	TRANSISTOR 2SA781K	HTA0099		1
TR847	TRANSISTOR 2SA781K	HTA0099		1
TR852	TRANSISTOR 2SB648A-C	HTB0087		1
TR853	TRANSISTOR 2SB648A-C	HTB0087		1
TR856	TRANSISTOR 2SD668A-C	HTD0100		1
TR857	TRANSISTOR 2SD668A-C	HTD0100		1
TR856	TRANSISTOR 2SC1722	HTC0514	1	
TR857	TRANSISTOR 2SC1722	HTC0514	1	
TR846	TRANSISTOR 2SA836D	HTA0105	1	
TR847	TRANSISTOR 2SA836D	HTA0105	1	
TR901	TRANSISTOR 2SC458C	HTC0148	1	1

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(PEF-517)

Symbol	Description	Code	Q'ty	
			V-202	V-352
C330	C,CERAMIC 50 V10000 PF+80%-20%	CCC1030	1	
C331	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C334	C,CERAMIC 50 V 33 PF+-5%	CCC1011		1
CV334	C,VARIABLE ECV-1ZW10×93	HX 3142155		1
C336	C,PLASTIC 50 V 2200 PF+-10%	CQA0093		1
C337	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C339	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029		1
C341	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029		1
C352	C,CERAMIC 50 V 22 PF+-5%	CCC1007	1	
CV352	C,VARIABLE ECV-1ZW20×93	HX 3142155	1	
C354	C,CERAMIC 50 V 10 PF+-0.5%	CCC1002		1
C356	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C357	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029		1
C357	C,CERAMIC 50 V10000 PF+80%-20%	CCC1030	1	
C358	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C359	C,CERAMIC 50 V 5 PF+-0.25PF	CCC0999		1
CV359	C,VARIABLE ECV-1ZW40×93	HX 3142155	1	
CV359	C,VARIABLE ECV-1ZW40×93	HX 3142155		1
C360	C,CERAMIC 50 V 15 PF+-5%	CCC1004		1
C360	C,CERAMIC 50 V 33 PF+-5%	CCC1011	1	
C361	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029		1
C362	C,CERAMIC 500 V 1 PF+-0.25PF	CCC1353		1
C362	C,CERAMIC 500 V 2 PF+-1%	CCC1138	1	
C363	C,CERAMIC 500 V 1 PF+-0.25PF	CCC1353		1
C363	C,CERAMIC 500 V 2 PF+-1%	CCC1138	1	
C364	C,CERAMIC 50 V 47 PF+-5%	CCC1014		1
C365	C,CERAMIC 50 V 47 PF+-5%	CCC1014		1
C368	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1
C371	C,CERAMIC 50 V 47 PF+-5%	CCC1014		1
C372	C,CERAMIC 50 V 47 PF+-5%	CCC1014		1

Symbol	Description	Code	Q'ty	
			V-202	V-352
C373	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1
C374	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1
C375	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1
C376	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1
C377	C,CERAMIC 500 V10000 PF+-10%	CCD0218		1
C378	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029		1
C1034	C,CERAMIC 500 V10000 PF+-10%	CCD0218	1	1
C1035	C,CERAMIC 50 V10000 PF+80%-20%	CCC1030	1	1
D331	DIODE HZ7BT-D	HDH0040		1
D332	DIODE HZ5B T-D	HDH0029	1	1
D333	DIODE HZ7B T-D	HDH0040		1
D333	DIODE HZ5B T-D	HDH0029	1	
D361	DIODE HZ5B T-D	HDH0029	1	
L366	COIL FL-3H R47 M	TLF0052		1
L366	COIL FL-3H 2R2M	TLF0058	1	
L367	COIL FL-3H R47M	TLF0052		1
L367	COIL FL-3H 2R2M	TLF0058	1	
P330	CONNECTOR 171825-3	JBX0468	1	
P331	CONNECTOR 171825/6	JBX0470	1	1
P332	CONNECTOR 171825/3	JBX0468	1	1
PEF-517	PCB PB-5	H 116452		
		H 291481		
R331	R,METAL 1/4W 100 OHM+-1%	RME0652	1	1
R332	R,METAL 1/4W 100 OHM+-1%	RME0652	1	1
R333	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060		1
R334	R,METAL 1/4W 121 OHM+-1%	RME0653		1
R336	R,CARBON 1/4W 8.2 KOHM+-5%	RCR3074		1
R337	R,METAL 1/4W 1.21 KOHM+-1%	RME0665		1
R338	R,METAL 1/4W 1.21 KOHM+-1%	RME0665		1
R339	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1

Symbol	Description	Code	Q'ty	
			V-202	V-352
R340	R,CARBON 1/4W 150 OHM+-5%	RCR3032		1
R341	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1
R342	R,CARBON 1/4W 150 OHM+-5%	RCR3032		1
R349	R,CARBON 1/4W 100 OHM+-5%	RCR3028		1
R350	R,METAL 1/4W 150 OHM+-1%	RME0654		1
R351	R,METAL 1/4W 150 OHM+-1%	RME0654		1
R352	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	
R353	R,METAL 1/4W 150 OHM+-1%	RME0654		1
R353	R,METAL 1/4W 82.5 OHM+-1%	RME0651	1	
R354	R,CARBON 1/4W 10 KOHM+-5%	RCR3076		1
R354	R,CARBON 1/4W 1 KOHM+-5%	RCR3052		1
R355	R,METAL 1/4W 1.00 KOHM+-1%	RME0664		1
R355	R,METAL 1/4W 1.27 KOHM+-1%	RME0816	1	
R356	R,METAL 1/4W 1.27 KOHM+-1%	RME0816	1	
R356	R,METAL 1/4W 1.00 KOHM+-1%	RME0664		1
R357	R,METAL 1/4W 274 OHM+-1%	RME0715		1
R357	R,METAL 1/4W 681 OHM+-1%	RME0662	1	
R358	R,METAL 1/4W 681 OHM+-1%	RME0662	1	
R358	R,METAL 1/4W 274 OHM+-1%	RME0715		1
R359	R,METAL 1/4W 681 OHM+-1%	RME0662	1	1
R360	R,METAL 1/4W 681 OHM+-1%	RMR0662	1	1
R361	R,CARBON 1/4W 100 OHM+-5%	RCR3028		1
R362	R,METAL 1 W 10 KOHM+-5%	RMR2782	1	1
R363	R,METAL 1 W 10 KOHM+-5%	RMR2782	1	1
R364	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1
R364	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	
R365	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	
R365	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1
R366	R,CARBON 1/4W 330 OHM+-5%	RCR3040		1
R366	R,CARBON 1/4W 390 OHM+-5%	RCR3042	1	

Symbol	Description	Code	Q'ty	
			V-202	V-352
R367	R,CARBON 1/4W 390 OHM+-5%	RCR3042	1	
R367	R,CARBON 1/4W 330 OHM+-5%	RCR3040		1
R368	R,CARBON 1/2W 22 KOHM+-5%	RCR3191		1
R368	R,METAL 1 W 33 KOHM+-5%	RMR2785	1	
R369	R,METAL 1 W 10 KOHM+-5%	RMR2782	1	
R369	R,METAL 1 W 10 KOHM+-5%	RMR2782		1
R370	R,METAL 1 W 10 KOHM+-5%	RMR2782		1
R370	R,METAL 1 W 10 KOHM+-5%	RMR2782	1	
R371	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	
R371	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1
R372	R,CARBON 1/4W 47 OHM+-5%	RCR3020		1
R372	R,CARBON 1/4W 22 OHM+-5%	RCR3012	1	
R373	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
R374	R,CARBON 1/4W 2.2 KOHM+-5%	RCR3060	1	1
R375	R,METAL 1/4W 182 OHM+-1%	RME0655		1
R375	R,METAL 1/4W 150 OHM+-1%	RME0654	1	
R376	R,METAL 1/4W 150 OHM+-1%	RME0654	1	
R376	R,METAL 1/4W 182 OHM+-1%	RME0655		1
R377	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1
R378	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1
R379	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1
R380	R,CARBON 1/4W 47 OHM+-5%	RCR3020	1	1
R381	R,CARBON 1/4W 10 OHM+-5%	RCR3004		1
R1032	R,CARBON 1/4W 220 OHM+-5%	RCR3036	1	1
R1033	R,CARBON 1/4W 27 KOHM+-5%	RCR3086	1	
RV1033	VR,METAL CR29R 47 KOHM	H 8348450	1	1
R1034	R,CARBON 1/4W 68 KOHM+-5%	RCR3096	1	
R1034	R,CARBON 1/4W 33 KOHM+-5%	RCR3088		1
RV1035	VR,METAL CR29R 220 KOHM	H 8348450	1	1
R1036	R,CARBON 1/4W 100 OHM+-5%	RCR3028		1

Symbol	Description	Code	Q'ty	
			V-202	V-352
TR331	TRANSISTOR 2SA781K	HTA0099		1
TR332	TRANSISTOR 2SA781K	HTA0099		1
TR333	TRANSISTOR 2SC1906	HTC0338	1	1
TR334	TRANSISTOR 2SC1906	HTC0338	1	1
TR335	TRANSISTOR 2SC1374H	HTC0328	1	1
TR336	TRANSISTOR 2SC1374H	HTC0328	1	1
TR337	TRANSISTOR 2SD668A-C	HTD0100		1
TR337	TRANSISTOR 2SB718C	HTD0116	1	
TR338	TRANSISTOR 2SB718C	HTD0116	1	
TR338	TRANSISTOR 2SD668A-C	HTD0100		1
TR339	TRANSISTOR 2SB718C	HTB0108	1	
TR339	TRANSISTOR 2SB648A-C	HTB0087		1
TR340	TRANSISTOR 2SB718C	HTB0108	1	
TR340	TRANSISTOR 2SB648A-C	HTB0087		1
TR341	TRANSISTOR 2SA741H	HTA0088		1
TR341	TRANSISTOR 2SA781K	HTA0099	1	
TR342	TRANSISTOR 2SA781K	HTA0099	1	
TR342	TRANSISTOR 2SA741H	HTA0088		1

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(PEF-518～524)

Symbol	Description	Code	Q'ty	
			V-202	V-352
C1	C,PLASTIC 600 V 22000 PF+-10%	CQX0071	1	1
C101	C,PLASTIC 600 V 22000 PF+-10%	CQX0071	1	1
C1202	C,PLASTIC 50 V 10000 PF+-10%	CQA0097	1	1
C1203	C,AL ELYC 25 V 100 UF	CEC0177	1	1
C1204	C,CERAMIC 50 V 1000 PF+80%-20%	CCC1029	1	1
C1303	C,AL ELYC 25 V 10 UF	CEC0175	1	1
C1304	C,AL ELYC 25 V 10 UF	CEC0175	1	1
D1301	DIODE HZ7BT-D	HDH0040	1	1
D1302	DIODE HZ7BT-D	HDH0040	1	1
D1303	DIODE 1S2075 T-D	HDS0108	1	1
D1304	DIODE 1S2075 T-D	HDS0108	1	1
IC1201	IC CD4011UBE	IDC0089	1	1
J1011	SOCKET PS-085	JSP0001	1	1
PEF-518	PCB PB-5	H 116452		
		H 291481		
PEF-519	PCB PB-5	H 116452		
(V-202)		H 291481		
PEF-520	PCB PB-5	H 116452		
(V-352)		H 291481		
PEF-521	PCB PB-5	H 116452		
		H 291481		
PEF-522	PCB PB-5	H 116452		
		H 291481		
PEF-523	PCB PB-5	H 116452		
		H 291481		
PEF-524	PCB PB-5	H 116452		
		H 291481		
P802	CONNECTOR 171825-8	JBX0467	1	1
P1001	CONNECTOR 171825-3	JBX0468	1	1
P1303	CONNECTOR 171825-6	JBX0470	1	1

Symbol	Description	Code	Q'ty	
			V-202	V-352
PL1401A	LAMP SCALE LAMP 14V 80MA	HX 8329332	1	1
PL1402A	LAMP SCALE LAMP 14V 80MA	HX 8329332	1	1
RV518	VR,CARBON V16L4-N20KC 2 KOHM	HX 3142131	1	1
R518	R,CARBON 1/4W 820 OHM+-5%	RCR3050	1	1
R519	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
RV815	VR,CARBON EVH-Y13K20B14	RDE0003	1	1
		HX 8311705	R	R
		HX 8311701	R	R
RV1026	VR,CARBON EVH-CCAS15B14 10 KOHM	H 8348451	1	1
R1031	R,CARBON 1/4W 100 KOHM+-5%	RCR3100	1	1
R1201	R,CARBON 1/4W 39 KOHM+-5%	RCR3090	1	1
R1202	R,CARBON 1/4W 47 KOHM+-5%	RCR3092	1	1
RV1203	VR,METAL CR29R 4.7 KOHM	H 8348450	1	1
R1203	R,CARBON 1/4W 15 KOHM+-5%	RCR3080	1	1
R1204	R,CARBON 1/4W 750 OHM+-5%	RCR3049	1	1
VR1303	VR,CARBON EVH-CCAK20B14 10 KOHM	H 8348452	1	1
R1303	R,CARBON 1/4W 4.7 KOHM+-5%	RCR3068	1	1
S1	SW,SLIDE SSB023 L=9 NS PCB	SSV0042	1	1
S101	SW,SLIDE SSB023 L=9 NS PCB	SSV0042	1	1

ELECTRICAL REPLACEABLE PARTS LIST
CIRCUIT BOARD(CHASSIS)

Symbol	Description	Code	Q'ty	
			V-202	V-352
D1111	DIODE SR103D (WITH MOUNT)	HDS0234	1	1
DL1301	DELAY LINE CD-3A	HX 8311741		1
J1	COAX.CON BNC071	JHB0088	1	1
J101	COAX.CON BNC071	JHB0088	1	1
J401	COAX.CON BNC071	JHB0088	1	1
J402	TERMINAL Z-048	HX 8338351	1	1
J901	COAX.CON BNC071	JHB0088	1	1
J1102	CONNECTOR CM3 (C-170)	JJC0026	1	1
J1103	TERMINAL S-17221 (100/120/220/240V)	HX 3142147	1	1
J1201	TERMINAL BLACK	HX 4114183	1	1
	HLDR CB-3	ERS0004	1	1
L1026	COIL ROTATION COIL	H 8348453	1	1
F1101	FUSE MF61NM 2 (2A 250V)JIS	EFG0352	1	1
F1101	FUSE MF61NM 1 (1A 250V)JIS	EFG0344	(1)	(1)
P1100	CONNECTOR 171825-3	JBX0468	1	1
P1101	CABLE,AC VM1165B-1172B A=JAPAN	BBZ0182	1	1
P1101	CABLE,AC VM0099-0081 C=EUROPE	BBZ0183	(1)	(1)
P1101	CABLE,AC VM0033-0076B A=USA,CSA	BBZ0184	(1)	(1)
P1101	CABLE,AC 0118-0081 S=AUSTRLA	BBZ0214	(1)	(1)
P1101	CABLE,AC 0113 B=ENGLAND	BBZ0215	(1)	(1)
	CONNECTOR ASSEMBLY	H 3142152	1	
	CONNECTOR ASSEMBLY	H 3142152		1
P1162	CONNECTOR 171825-3		1	1
R1	R,CARBON 1/4W 10 OHM+-5%	RCR3004	1	1
R101	R,CARBON 1/4W 10 OHM+-5%	RCR3004	1	1
R400	R,CARBON 1/4W 100 OHM+-5%	RCR3028	1	1
RV1101	VR,CARBON V24L5S(U12DV-C)20KC-10KOHM	HX 3142133	1	1
RV1016	VR,CARBON EVM-R7GS20B26	RDE0028	1	1
T1101	XFMR D#3142142	H 3142142	1	1
V1001	CRT 140BMB31R	DPX0063	1	

Symbol	Description	Code	Q'ty	
			V-202	V-352
V1001	CRT 140DFB31	DPX0065		1
	HLDR SKB-3M	ERL0009	1	
	HLDR SKB-4M	ERL0093		1
	CONNECTOR 171822-3	JBX0449	1	1
	CONTACT 170205-1	JYX0252	2	2

MECHANICAL REPLACEABLE PARTS LIST(V-202, V-352)

Symbol	Description	Code	Q'ty	Remarks
1	Chassis, rear	292452-A	1	
2	Cover	292453-A	1	
3	Cover bottom	292454-A	1	
4	Angle, right	292458-AA	1	
5	Angle, left	292459-AA	1	
6	Crt shield plate	3156120-A	1	
	Cushion	8345481-A	1	
7	Bracket	8345482-A	1	
	Cushion	8345479-A	1	
8A	CRT band	3144088-A	1	V-202
8B	CRT band	3140791-A	1	V-352
9A	CRT band	8345474-A	1	V-202
9B	CRT band	8330671-A	1	V-352
10	Bracket, VR	8345475-A	1	
15	Earth bracket	8354104-A	1	V-352
16	Screw plate	8345476-A	2	
17	Support bracket	8322308-A	1	
30	Subpanel, front	117459-A	1	
31A	Panel, front	292463~64-A	1	V-202
31B	Panel, front	292463~64-B	1	V-352
32	Panel, rear	293071-A	1	
34A	Shield band, CRT	8348611-A	1	V-202
	Rubber	8348612-A	1	
34B	Shield band, CRT	8348611-B	1	B-352
	Rubber	8348612-B	1	
35	Lock, handle	8345467-A	2	
36A	Band	ERL0009	1	V-202 SKB-3M
36B	Band	ERL0093	1	V-352 SKB-4M
37	Support	8340165-A	3	LCBS-03N
38	Support	8340165-D	6	LCBS-08N

Simbol	Description	Code	Q'ty	Remarks
39	Spacer	XC10097	1	PS-4N
41	Foot, rear	3149317-A	4	
42	Knob	3149321-A	9	S18
43	Knob	3140804-A	3	S22
44	Knob	3149322-A	1	S24
45	Knob	3149325-A	3	LSW
46	Handle	3156100~01-A	1	
49A	Bezel	282239-A	1	V-202
	Name plate	8345860-A	1	
	Filter	3156102-A	1	
	Clip	XCF0141	2	No.076
49B	Bezel	282239-A	1	V-352
	Name plate	8345860-B	1	
	Filter	3156102-A	1	
	Clip	XCF0141	2	No.076
50A	Rubber	3144055-A	2	V-202
50B	Rubber	3144055-B	2	V-352
52	Foot	3140755-A	4	
54	Plate	8318971-A	1	
55	Bush	ERR0073	1	B-312-250
56	Laber	8316162-A	1	
57	Bush	8345947-A	2	G-99
58	Plate lamp guide	8348613-A	1	
59	Heat sink bracket	8354075-A	1	
60	Cushion, CRT	8353529	1	
65	Bush	8340166-B	2	
70	Board	PEF-515	1	
	Shield case, HV	8316093-A	1	
	Earth plate	8318959-A	2	
	Heat sink	8329719-A	4	

Symbol	Description	Code	Q'ty	Remarks
71A	Board	PEF-516	1	V-202
	Heat sink	8329719-A	2	
71B	Board	PEF-516	1	V-352
72	Board	PEF-517	1	
	Heat sink	8316092-A	2	
80	Screw, flat	XCA0168	4	M2.6×4
81	Screw, flat	XCA7306	7	M3×6
82	Screw, flat	XCA7308	3	M3×8
84	Screw	XCA6306	8	M3×6
85A	Screw	XCA6308	22	V-202 M3×8
85B	Screw	XCA6308	20	V-352 M3×8
86	Screw	XCA6312	4	M3×12
87	Screw	XCA1797	2	M3×20
88	Screw	XCA6410	2	M3×10
90	Screw, sems	XCA0661	3	M3×8
91	Screw, sems	XCA1319	6	M4×12
92	Screw, sems	8340167-C	4	M4×20
95	Washer	XCA0133	3	M3
97	Washer spring	XCA0107	3	M3
99	Nut	XCA1706	3	M3

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